SMITHSONIAN INSTITUTION
THE LIBRARY
FOR THE INCREASE AND DIFFUSION OF KNOWLEDGE AMONG MEN
SMITHSONIAN INSTITUTION WASHINGTON 1846

SMITHSONIAN INSTITUTION THE LIBRARY

Journal
of the East Africa Natural History Society

APRIL, 1953. VOL. XXII. Nos. 1 (93)

SMITHSONIAN
SEP 17 1953
LIBRARY

EAST AFRICA NATURAL HISTORY SOCIETY.

PATRONS.

His Excellency The Hon. Sir Evelyn Baring, K.C.M.G., K.C.V.O.

Sir Philip Mitchell, K.C.M.G.

Sir Henry Moore, K.C.M.G.

Air-Vice-Marshall Sir Robert Brooke-Popham, G.C.V.O., K.C.B., C.M.G., D.S.O., A.F.C.

PRESIDENT.

Hugh Copley Esq., O.B.E.

VICE-PRESIDENT.

R. W. Rayner Esq., B.A., A.L.C.T.A.

EXECUTIVE COMMITTEE.

P. R. O. Bally Esq.,

Colonel M. H. Cowie,

W. Hale Esq.,

J. S. Karmali Esq.,

T. Magner Esq.,

Miss E. J. Blencowe.

J. McDonald Esq., C.B.E., D.F.C.

Miss M. D. Ball.

SECRETARY.

Miss D. Ewing.

HON. EDITOR.

J. G. Williams Esq., M.B.O.U.

HON. TREASURER.

W. R. Bowles Esq.,

HON. LIBRARIAN.

R. A. F. Brenan Esq.,

All correspondence in connection with this Journal should be addressed to: The Hon. Secretary, P.O. Box 658, Nairobi.

506.67
v. 22
1953-55

Journal
of the East Africa Natural History Society

APRIL, 1953. VOL. XXII. Nos. 1 (93)

CONTENTS

THE WATER-HOLES AT IJARA

NORTHERN PROVINCE, KENYA.

by

Lord R. C. Percy, H. E. Percy and M. W. Ridley.

In August 1951 the authors went to the Northern Province of Kenya, with the object of collecting birds and other small vertebrates. During this expedition they camped by the village of Ijara from August 21st to 28th. A few general observations on the water-holes in this area, although made over such a short time, may be of interest, especially to those who from time to time have access to the area and can take up the story for other times of the year.

Ijara, at 250 ft. above sea level, lies some 100 miles south of Garissa. The Tana River is about 30 miles to the west at its nearest point. The surrounding country lying in the Acacia-desert grass savannah belt (Edwards 1940) is flat and covered with bush; but 15 miles to the south east the vegetation gradually becomes thicker until country with considerable trees (Acacia-tall grass savannah) is reached. Records for mean annual rainfall are not available, but for Garissa the figure is 10.3 inches. The rain is extremely unevenly distributed, generally occurring in April and November-December and it is probable that this figure will be greater at Ijara because it lies nearer the cost. At times, however, the area is subject to severe drought. During the time spent at Ijara the temperature did not exceed 89° F in the shade. The figure for relative humidity, as might be expected, decreased with the height of the day to around 45%, but there was no extreme aridity and sometimes there was dew in the early morning. The bushes were in leaf and at that time formed a refreshing contrast to the arid, sometimes nearly leafless, bush to the north west.

The soil is light and sandy, but where rain water has accumulated in depressions or pans, a fine black mud is deposited which cracks on drying out. It was found that 2 inches below the sun-baked surface, the mud was damp and extremely sticky. Dead ostracods and gastropod shells showed that a temporary population of aquatic animals is developed in time of rain

In such situations four somewhat more permanent water-holes have been dug out in the interest of a few Somalis who graze their stock at Ijara. In past periods of drought, the few traders comprising the village, with no business, either closed down or carried on for a while by selling imported drums of water. The water-holes are roughly circular or oblong in shape.

Water-hole 1 was 6-7 feet deep in the centre with a gradual slope to the sides where the depth varied from 2 ft. at one side to complete shallows in other places. It was dug near a temporary rain pool in 1930-31. Its sides were then more or less sheer to about 6 feet. Up to 1937 it is not known to have dried up, but in subsequent years it is said to have dried up during times of drought, and in the middle of February 1951 about five or six weeks before the rains broke, it is recorded that only a little water was left in a hole in the middle.

Water-hole 2 was about 9 feet deep at one end and at the other there were shallows. It was dug shortly after water-hole 1, and up to 1937 it never dried up, and has probably not done so since. It appears to be the most permanent water-hole and it is the only one of the four in which water-lilies *Nymphaea lotus* are growing. They appeared in 1933 and seem to be thriving

Water-hole 3 had shallows all round the sides with a miniature swamp of rushes at the north end. The maximum depth at the centre was found to be about 7 feet. It seems to have been dug some time after water-holes 1 and 2. It was observed to be completely dry at the end of February 1951.

Water-hole 4 was very shallow round the sides and its maximum depth was 9 feet in the centre. Digging was begun in 1933-34.

The water-holes were surrounded by hedges or fences of cut thorn to prevent animals trampling the edges. In places these had been broken down As a further measure of control concrete water troughs had been placed at each. Water-hole 2 did not appear to be much in use, probably because at that time there was plenty of water in the others which may have been more convenient. There was evidence that game drank at all of them except No. 1, which was nearest the village. Elephant's footprints were especially conspicuous at No. 4.

Some dozen measurments with a B.T.H. Capillator taken at various times on different days gave pH values of around 7.5 for water-holes 2, 3 and 4, and around 8 for water-hole 1. A maximum-minimum thermometer placed on an average $1\frac{1}{2}$ feet below the surface of the water and a few feet from the sides indicated that at that time variations of temperature of the magnitude of 10°F sometimes occurred in a 24 hour period. Temperatures from minimum 74 to maximum 84 were recorded. Water-hole 4 gave the greatest variation having an extensive area of shallows.

Invertebrates.

An abundant invertebrate fauna was present in and around the waterholes. At that time there was no drought, and when digging a hide about 10 ft. from the water's edge, even earthworms were found. Especially noticeable on the land were large millipedes, many butterflies, large orthopterous insects and empty shells of the giant African snail *Achatina fulica* Fer.

A few members of the more conspicuous aquatic component are recorded as being indicative of the kind of food supplies upon which the thriving fish population must directly depend.

As might be expected Diptera, Dragonflies and aquatic Hemiptera were abundant. Dragonflies recorded were:—

Philonomon luminans Kars. *Orthetrum chrysostigma* Burm.
Ceriagrion glabrum Burm. *Diplacodes Lefebvrei* Ramb.
Ceriagrion suave Rs. *Brachythemis leucosticta* Burm.
Orthetrum brachiale Beuv.

The Hemiptera included an abundance of Notonectidae, Ranatridae and Corixidae and the belostamatid *Sphaerodema nepoides* Fab. Waterbeetles

belonging to several species were numerous. Identified were Dytiscids, *Rhantaticus congestus* Klug and *Cybister senegalensis* Aube. Gyrinid or whirligig beetles *Dineutes subspinosus* Klug could nearly always be seen on the surface of the water. Aquatic spiders and freshwater crabs *Deckenia imitatrix* Hilgendorf, the latter living by day in holes in the mud, were also present. Aquatic molluscs were not found in any numbers *Pila ovata* Olivier was present and was more abundant in water-hole 3 than elsewhere. Two shells of *Pila speciosa* Philippi were also found. Though the authors had little time to search for them, the apparent paucity of molluscs may perhaps be attributed to the large lung-fish population.

Fishes.

Twenty-one specimens of the lung-fish Protopterus amphibius (Peters)* were captured at three out of four water-holes. The number of larvae collected, together with the large number of fish seen surfacing, indicated that there was a thriving lung-fish population. Seven larger specimens between 330 and 405 mm were caught on a hook baited with meat; but the remainder being much smaller, were caught in a hand net from the water weed *Lagerosiphon* sp.

As in *P.annectens* Owen, where it is not unusual, (cf. Goodrich 1930), but in marked contrast to certain specimens of *P.ethiopicus* Haeckel from Lake Victoria, with which they were compared by the authors, the larger specimens retained considerable vestiges of the external gills of the larvae. A specimen measuring 384 mm overall length had a most dorsal external gill element on the right side of 36 mm and on the left of 31 mm. This specimen and another of 330 mm were full of spawn.

In the spiral valves of three of the larger specimens abundant remains of food were found. Insects appeared to play a large part in their diet. Especially pronounced were the crushed remains of beetle elytra. Also present were the opercula of freshwater snails, the remains of crabs, frogs and the little fish *Nothobranchius* (see below). In addition, a little plant material was present; but whether this had been taken in accidentally or not was uncertain.

The changes in form and growth rate of this species are not known in detail and the length of the tail filament was found to be extremely variable often having been broken. The 14 smaller specimens showed a fair gradation in length from 18 mm to 110mm, which suggested that the breeding season may have been a prolonged one that year. If the rate of growth of this species is broadly comparable with that of the specimens of *P.annectens* described under natural conditions in Gambia (cf. Budgett 1901), the smallest specimens collected would compare with a specimen figured by him which was about a month old and which had left the nest only a few days before.

Footnote: *This species requires redescription and will be the subject of a further publication.

In 1925 and 1934 large numbers of small lung-fish were observed in the slowly-moving flood water formed by heavy rain right out in the desert country. (H. B. Sharpe in litt.) The Africans sometimes say that they fall with the rain. As is well known, these lung-fishes can survive drought by forming so-called cocoons in the mud; and they are sometimes dug up in this state for food by men, and sometimes even by animals. Larger numbers of small fish must be derived either from the spill-over from populations occupying, except in flood-time, stretches of permanent water, which seems to be the usual method, or from individuals recently emerged from cocoons. It seems that the latter method may apply in desert country far from permanent water. How soon these fish can breed after coming out of their cocoons is unknown, as is the minimum size for successful cocooning. In any case it may be fairly inferred that floodwater, charged with fry, must be an important factor in the distribution of this species. This would account for the occurrence of fishes in the water-holes. In the opinion of the authors, Ijara would be an especially suitable place to make observations on the breeding habits of these fish, as owing to their abundance, and the limited extent of the habitat, growth stages can be readily obtained, Nests were not found, and digging in a dry pan was of necessity very limited and produced no cocoons.

Nothobranchius guentheri (Pfeffer). Five specimens of his little cyprinodont were captured in a hand net from the water weed. There were females and one male in breeding colours. It may be significant that, unlike the lung-fishes, they were only found in water-hole 2, which is the most permanent.

Amphibians and Reptiles.

The extremely common and agile frog, *Rana mascareniensis*, D.&B. was present in great abundance around the water-holes. It was as usual difficult to catch, and when pursued would more often seek refuge in dense vegetation, or, in the case of water-hole 4, in the holes of a termitarium, than in the water. Large numbers of this species, accompanied by *Arthroleptis minutus* Blgr. were also found during the heat of the day in cracks in the sunbaked surface of the mud in a dried-up pan 200 yds. south east of water-hole 1. Tadpoles of both genera, together with those of *Phrynobatrachus sp.* were present in the water. Spawn was found in water-hole 2.

Pelusios (*Sternothaerus*) *nigricans* (Dondorff). An adult male Black Water Tortoise was caught on a hook baited with meat from water-hole 2. A large number of leeches were found attached to it. These tortoises are said to be common in water-holes in the Northern Provience.

Mabuya striata (Peters). Of lacertilians this striped skink was by far the most abundant. Although seldom seen on the ground, striped skinks could be found in many of the larger bushes. In the heat of the day they were most noticable basking in the sun. When frightened they would take refuge in holes in the trunks and branches, and one bush might contain several individuals. They could sometimes be induced to bolt by placing a piece of

lighted tow in a lower hole and watching at the upper exit. Some specimens contained embryos and an inspection of the gut contents of several individuals suggested that they were purely insectivorous.

Also recorded were the skink *Mabuya brevicollis* (Wiegm). and the common gecko *Hemidactylus mabouia* Mor.

No snakes were seen except for one specimen of the White-lipped or Herald snake *Crotophopeltis hotamboeia* (Laur.) In the past a python is said to have frequented water-hole 2.

Birds.

The Avifauna of the Ijara region does not appreciably differ from that of large areas of similar country in the Northern Province. A week's observation gave the impression that the population was at that time of the year distinctly higher than that of the Tana River area some 100 miles to the north west. This abundance was more in numbers of individuals than of species, but passerine birds were definitely more numerous than had been found and several species were met with that had not previously been seen by us in Kenya. This was presumably accounted for by the comparatively less arid conditions at Ijara and, to a limited extent, by the immediate proximity of the water-holes.

It was possible to divide the birds seen at Ijara into several groups. The first group includes those species which are typical of semi-desert conditions and which are found more or less all over the Northern Province Their presence at Ijara is thus in no way directly connected with the four water-holes. Examples belonging to this group are Vulturine Guinea-Fowl, Golden Pipit (also seen in very arid country near Garissa), Black-faced Sand-Grouse, Black-head Plover, Buff-crested Florican, Crested and Yellow-throated Francolin, Bateleur and Dikkop.

This group of birds is chiefly composed of seed eaters, and all are capable of travelling long distances to water.

The second group is typical of the surrounding bush and is directly dependant on it for its food. The bush consists of thickets of small euphorbias and aloes with scattered shrubs of *Thespesia danis* Oliv. and *Salvadoro persica* L. The former of these was much the commonest. Between the clumps, there was often bare ground. This group was composed mainly of passerine birds, and it is here that the numbers seen were higher than previously noted in other areas. These birds do not seem to wander far from water, and thus the water-holes are of importance to them. They are chiefly insect eaters. Examples are:— Magpie and Superb Starlings, Von der Decken's and Grey Hornbills, Turtle Doves, Buffalo Weavers, Nightjars, Bee-eaters, Mousebirds, Fork-tailed Drongos, and Waxbills.

Naturally these two groups are not separable with any certainty; but a third group, the water birds, includes all those species which are commonly dependent on water for their living. It is due to the water-holes that they are present. It was found possible to make an estimate of

the entire population at that time, as the four water-holes were close enough to be visited in one hour. The population was not very high because at that time there was probably water elsewhere in the neighbourhood.

It is probable that permanent water elsewhere would at any rate be well within range of such birds as ducks and herons, as our residents were often not to be seen for a day or two. We did not explore far from the village except down the road to the south east.

The population of water birds is as follows:—

3 Black-headed Herons
3 African Great White Egrets
2 Yellow-billed Egrets (on one occasion only)
1 Squacco Heron
1 Juvenile Night Heron
1 African Dwarf Bittern (possibly 2)
1 Green-backed Heron
8 Common Sandpipers (number approximate)
1 Wood Sandpiper
1 Green Sandpiper
1 Painted Snipe (male)
13 White-faced Tree-Ducks (2 adult, 11 juvenile)
3 Spurwing Geese
3 Lesser Waterhens (juvenile)
2 Crakes (small, sp. indet.)

Although the above list is not complete, it probably covers most of the regular inhabitants and gives some idea of the diversity and comparative richness of the group.

It is probable that observations over a longer period would indicate that a further group of birds should be mentioned. Those more typical of the wooded country to the east, such as Fischer's Red-necked Francolin, Madagascar Bee-eater and East Coast Red-cheeked Cordon-bleu.

Food.

Evidence as to diet was obtained chiefly from the examination of gut contents. A Night Heron contained the remains of Nothobranchius; and the South African Stone Curlew contained the remains of a frog. As frogs were exceedingly numerous it might be presumed that the herons depend on them for the majority of their food; but a Great White Egret, shot about 8 a.m., contained only a little plant material and the remains of insects. A Green-backed Heron was watched one evening clambering about in the topmost branches of a small tree, trying to catch moths, at which it was not very successful.

Lesser Waterhens had been feeding chiefly on the seeds of a rice *Oryza eichingeri Peter,* water beetle larvae and crabs. The remainder of the water birds examined contained the remains of unidentified insects.

Around the water-holes, in the long grass, bushes and rushes at the edge

of the water, insect life was noticeably abundant. The taller bushes provided useful look-outs for such birds as Shrikes and Drongos; while White-browed Coucals, Red-tailed Ant Thrushes, and Ground Barbets were also often seen. In contrast, the Striped Kingfishers preferred to watch from the numerous large termitaria and were not seen near any of the water-holes. A specimen of this species contained a large cricket and an even larger grasshopper.

At dusk large numbers of nightjars assembled over the water-holes and hawked for insects in the fading light. They appeared to find the air over the water holes very rich in insect life, as they seldom travelled far from their vicinity. Stomachs examined contained a large variety of insects. As well as Neuroptera and Orthoptera, the following families of insects could be recognised: Chrysomelidae, Copridae, Aphodiinae, Pentatomidae, Lygaeidae, Lestidae, Coenagriidae. It is worthy of note that these remains were such that specific identifications would have been possible in many cases.

Other insect-eating birds examined included the Juba Little Purple-banded Sunbird and Kenya Ashy Grass Warbler. Three specimens of the former contained remains of small spiders obtained from the topmost branches of the Thespesia trees. One specimen of the latter, a tiny, bird, contained a caterpillar over an inch long.

We did not examine crop contents of many vegetarian birds. Hornbills, Starlings and Turtle-doves, which were very numerous, were feeding chiefly on Commiphora-like fruit; and the Waxbills contained the seeds of the grass *Echinochloa haploclada* Stapf. This also made up for the bulk of the crop contents of Guinea-fowl shot for our own stomachs. These birds had also been feeding on the following seeds:— *Eragrostis* sp., *Dactyloctenium aegyptiacum, Portulaca* sp., *Glinus* sp., *Talinum* sp., *Ocimum* sp., and *Ruellia* sp.

Drinking.

In the early morning all species of Starlings recorded and a few black-faced Sand-grouse were seen drinking at every water-hole. Several different kinds of doves (laughing, red-eyed and turtle) were almost always present in the bushes around the water-holes. They and the magpie starlings do not appear to go far for their food, and pay frequent visits to the water. It appears that the water-holes have an appreciable effect on the local population of such birds. Francolins and Guinea-fowls were also seen to drink at times, but most of the other species were not actually observed at the water's edge. It was not possible to keep a sufficiently strict watch to throw any light on the drinking habits of other species.

Breeding.

Only a few birds were breeding at the time of our visit. Some were accompanied by fully fledged young. This would be expected, judging by the state of the vegetation which suggested that the rains were not long past. The most interesting bird nesting was the Juba Little Purple-banded

Sunbird. The nest of this bird has not been described before. It was quite common near Ijara, and three nests were found on August 24-27th, two with eggs, and one destroyed. All the nests were found on the outer branches of small bushes about 3 or 4 feet off the ground, and were made of grass and dead leaves. The eggs, spotted all over with dark brown, measure (two clutches of two eggs) — 15.4 x 11.1, and 16.5 x 11.3.

Other nests found included those of the following species:— Crested Francolin c/4, White-browed Coucal, White-headed Buffalo Weavers, and Kenya Voilet-backed Sunbird.

The following species were seen with newly-fledged young:— Buff-crested Florican, Yellow-throated Francolin, Lesser Waterhen, White-faced Tree-Duck, Ground Barbet, and Melba. It was somewhat surprising to find Woodpeckers in areas so devoid of all but the smallest trees, but there were holes in many of them, especially the Thespesia trees.

Systematic list of all birds seen or collected at Ijara, August 1951.

Ardea melanocephala Vigors and Children. Black-headed Heron. Three birds seen.

Casmerodius albus melanorhynchus (Wagler). African Great White Egret. Three birds seen. (One juvenile).

Mesophoyx intermedius brachyrhynchus (Brehm). African Yellow-billed Egret. Two birds on one occasion.

Ardeola r. ralloides (Scopoli). Squacco Heron. One at water-hole 3.

Butorides striatus atricapillus (Afzelius). Green-backed Heron One seen.

Nycticorax n. nycticorax (L.) Night Heron. One juvenile. Water-hole 3.

Ardeirallus sturmii (Wagler). African Dwarf Bittern. One seen.

Scopus umbretta bannermani C. Grant Hammerkop. One seen.

Leptoptilos crumeniferus (Lesson). Marabou. Two scavenging in village.

Dendrocygna viduata (L.) White-faced Tree-Duck. 13 seen.

Plectropterus g. gambensis (L.) Spurwing Goose. 3 seen once.

Gyps ruppellii erlangeri Salvadori. Abyssinian Griffon. 2 seen.

Pseudogyps africanus (Salvadori). White-backed Griffon. 3 or 4 seen.

Necrosyrtes monachus pileatus (Burchell). Hooded Vulture. Common.

Milvus migrans sub sp. African Kite. Common.

Terathopius ecaudatus (Daudin) Bateleur. Seen occasionally.

Melierax poliopterus Cabanis. Chanting Goshawk. 1 obtained.

Francolinus sephaena grantii Hartlb. Colonel Grant's Crested Francolin. Numerous and breeding.

Pternistis cranchii leucoparaeus Fischer and Reichenow. Fischer's Red-necked Francolin. Seen commonly on edge of wooded country to the south east of Ijara.

Pternistis leucoscepus infuscatus Cabanis. Yellow-throated Francolin. Common. Juveniles seen.

Acryllium vulturinum (Hardwicke). Vulturine Guinea-Fowl. Very common in large flocks.

Gallinula angulata Sundevall. Lesser Moorhen. 3 seen.

Lophotis g. gindiana (Oustalet). Buff-crested Florican. A few seen, one bird accompanied by a juvenile.

Sarciophorus tectus latifrons Reichenow. Blackhead Plover. Common and often seen in threes.

Rostratula benghalensis (L.) Painted Snipe. One seen.

Actitis hypoleucos (L.) Common Sandpiper. Numerous.

Tringa ochropus L. Green Sandpiper. One

Tringa glareola L. Wood Sandpiper. One.

Burhinus c. capensis (H. Lichtenstein) Cape Dikkop. A few only seen.

Pterocles d. decoratus (Cabanis). Black-faced Sand-grouse. Not numerous, but a few came to drink every morning.

Streptopelia s. semitorquata (Ruppell). Red-eyed Dove. not uncommon.

Streptopelia capicola tropica (Reichenow). Ring-necked Dove. Probably the most common bird at Ijara.

Stigmatopelia senegalensis aequatorialis (Erlanger). Laughing Dove. Common

Oena c. capensis (L.) Namaqua Dove. Although very common to the west, we saw only one bird at Ijara.

Turtur c. chalcospilos (Wagler). Emerald-spotted Dove. Not common.

Centropus s. superciliosus Hemprich and Ehrenberg. White-browed Coucal. Fairly numerous. Two nests found.

Coracias caudatus lorti Shelley. Somali Roller. One seen.

Halcyon c. chelicuti (Stanley). Striped Kingfisher. Abundant.

Merops superciliosus L. Madagascar Bee-eater. Seen mostly in wooded country to the East.

Melittophagus pusillus cyanostictus (Cabanis). Little Bee-eater. Two seen.

Lophocerus n. nasutus (L.) Grey Hornbill. Although we did not see this bird in the rest of our travels through the Northern Province, it was quite common at Ijara. On three occasions in the wooded country to the East it was seen to accompany troupes of baboons; but we cannot say if this has any significance.

Lophoceros deckeni (Cabanis). Von der Decken's Hornbill. Apart from the previous species, this was the only Hornbill we saw, and it was quite common.

Scotornis climacurus clarus (Reichenow). Long-tailed Nightjar. Very abundant, especially at dusk.

Colius striatus mombassicus van Someren. Mombasa Speckled Mousebird. Common.

Trachyphonus darnaudii boehmi Fischer and Reichenow. Black-capped Ground Barbet. Common.

Campethera nubica pallida (Sharpe). Nubian Woodpecker. Few seen.

Mirafra p. poecilosterna (Reichenow). Pink-breasted Singing Lark Common Seen always singly.

Tmetothylacus tenellus (Cabanis). Golden Pipit. This beautiful bird was very abundant, always in flocks, which were very wary. It flew to the trees when disturbed.

Macronyx aurantiigula Reichenow. Orange-throated Long-claw. One seen near one of the water-holes in the evening.

Pycnonotus dodsoni Sharpe. White-eared Geelgat. Common.

Erythropygia l. leucoptera (Rüppell) White-winged Scrub-Robin. Common. Keeping always to the thickest bush, and uttering loud protests if disturbed.

Neocossyphus r. rufus (Fisher and Reichenow). Red-tailed Ant Thrush. Found in the thickest herbage around the ponds and very skulking.

Calamonastes s. simplex (Cabanis). Grey Wren-Warbler. Very common.

Cisticola cinereola schillingsi Reichenow. Kenya Ashy Grass Warbler. Common.

Hirundo abyssinica unitatis Sclater and Mackworth-Praed. Striped Swallow The only swallow we saw was almost certainly of this species.

Dicrurus adsimilis divaricatus (Lichtenstein). Fork-tailed Drongo.

Eurocephalus r. rueppelli Bonaparte. White-crowned Shrike. Common.

Lanius cabanisi Hartert. Long-tailed Fiscal One or two seen.

Anthoscopus sp. indet. Penduline Tit. Some birds seen, but we did not get any specimens, and the species was not determined.

Oriolus larvatus rolleti Salvadori. Black-headed Oriole. Only two seen.

Creatophora cinerea (Meuschen). Wattled Starling. A few were associating with the next species.

Speculipastor bicolor Reichenow. Magpie Starling. Very common. The large and noisy flocks were seen everywhere.

Lamprotornis p. purpuropterus Ruppell. Ruppell's Long-tailed Glossy Starling. Rare.

Spreo fischeri (Reichenow). Fischer's Starling. Rare, associating with the other species of the genus.

Spreo superbus (Ruppell). Superb Starling. Very common everywhere.

Spreo shelleyi (Sharpe). Shelley's Starling. A few seen among the last species.

Buphagus e. erythrorhynchus (Stanley). Red-billed Oxpecker. Small numbers on the native flocks.

Cinnyris chalcomelas Reichenow. Juba Little Purple-breasted Sunbird. we found this rare Sunbird abundant, and apart from the next species, it was the only Sunbird seen. The males were very noisy and much in evidence.

Anthreptes o. orientails Hartlb. Kenya Violet-backed Sunbird. One nest of this species was found in a small bush in the village. It contained two newly-hatched young and the male was seen to feed the female on the nest.

Dinemellia d. dinemelli (Ruppell). White-headed Buffalo Weaver. Common

Bubalornis albirostris intermedius (Cabanis). Buffalo Weaver. Some seen.

Ploceus i. intermedius Ruppell. Abssinian Masked Weaver. A few seen.

Pytilia melba sub sp. Melba. Common.

Uraeginthus bengalus ugogoensis Reichenow. East Coast Red-cheeked Cordon bleu. Seen to the East of Ijara only, on the edge of the wooded country.

Mammals.

A number of mammals sp. indet. were listed as seen or heard at Ijara. Elephants, though sometimes a nuisance at the water-holes, were not seen, but a skull, numerous droppings and footprints were most noticeable. The remaining larger mammals, Hyaena, Gerenuk, Dik-dik, Water-buck, Reticulated Giraffe and Zebra call for no special comment for they are typical of many areas in the Northern Provience. A cat, taken to be a serval, was seen at night, and we had fleeting glimpses of a small mongoose and a squirrel that appeared to inhabit a termitarium.

Only one monkey was seen. We came upon it quite suddenly at water-hole 3. It was inferred to be the common *Cercopithecus aethiops*. It seemed to be about to drink but disappeared very quickly. It had probably come from the wooded country to the East, where numbers of monkeys were seen by the authors.

The following animals which have no special significance at Ijara were seen: the Ground Squirrel *Xerus rutilus rufifrons* Dollman, several specimens; a white-tailed Mongoose *Ichneumia albicauda ibeana* (Thomas); and and a hare *Lepus capensis raineyi Heller*.

The Bats *Nycteris aurita* K. Anderson, and *Tadarida (Chaerephon) limbatus* Peters were common. Though some were brought in by the Africans, others were found in hollow trees so characteristic of the area.

Trapping for small mammals produced one shrew, one dormouse, and two species of spiny mouse. The shrew, *Crocidura macarthuri* St. Leger, seems to be a very little known species. The type is described from Merafano, Tana River, in 1932. The authors can give no estimate of its relative abundance or adaptations. The dormouse was identified as *Claviglis parvus* True. The spiny mice were *Acomys ignitus kempi* Dollman, three specimens, and *Acomys wilsoni ablutus* Dollman, two specimens. A further specimen sp. indet. was destroyed. It was found extremely important to visit the traps regularly as the ants tended, as so often in Africa, to damage the specimens left in the traps too long. Though estimates on such limited data are risky, the authors had the impression that spiny mice were relatively common at Ijara. From experiments in placing traps, it was inferred that these species were arboreal in habit. It seems probable therefore that further trapping in the area by an experienced naturalist would be of interest.

A further rodent recorded was the gerbil *Taterillus nubilus illustris* Dollman. This was quite common. No wild mammals were observed drinking.

Summary.

The water-holes at Ijara are described. Although severe drought occurs at times, the rains cause extensive flooding over the Ijara area. They present no special problems of isolation.

The species of vertebrates seen during a week at Ijara in August, 1951,

are recorded. Though inferred to be but a limited proportion of those present, they are indicative of an abundant fauna. Two groups of animals are of special interest, the fishes and the birds.

The little cyprinodont *Nothobranchius guentheri* was present, and the lung-fish *Protopterus amphibius* in abundance. No evidence was found that these fishes had been introduced by man. They are inferred to have arrived at some time in the flood water. A few aspects of this problem are discussed. Larval specimens of lung-fish were readily obtained. Further observations on their life history would be of general interest.

There is a typical Northern Province avifauna at Ijara, noticeably richer than in areas further West. Three groups of birds are distinguished, a semi-desert group, a group partly dependent on the proximity of water supplies and an aquatic group. Notes on the food of these birds are given where obtained, and the observed occurrences of drinking at the water-holes. A note is given on the breeding conditions of some of the species. together with a complete list of all the species seen or collected.

Acknowledgements.

We tender sinecre thanks to Lt-Col. C. H. Stockley, O. B. E., D. S. O., M. C., and Mr. C. Chevenix Trench for information concerning Ijara at the present time, also to Mr. H. B. Sharpe, whose interesting observations in the past, and knowledge of the area, have been freely incorporated in this article. We owe a special debt of gratitude to William Hale and the Kenya Game Department, and also to Mr. J. G. Williams of the Coryndon Museum, for his kind encouragement and help. In addition, this would have been impossible without the kind assistance of Mr. E. Pinhey, Mr. P. Bally, and other members of the Staff of the Museum. Sincere thanks are also tendered to Dr. H. W. Parker, Mr. J. C. Battersby, Dr. E. Trewavus, Captain C. H. B Grant, Mr. T. C. S. Morrison-Scott, Mr R. W. Hayman, Miss A. G. C. Grandison and other members of the Staff of the British Museum (Natural History), who kindy identified the specimens collected. For drawing the map, sincere thanks are due to Mr. D. P. Graham.

References.

Budgett, J. S. (1901) "On the breeding habits of some West-African Fishes, with an account of the External Features in Development of *Protopterus annectens,* and a Description of the Larva of *Polyterus lapradei*" Trans. Zoo. Soc. London 16. 115

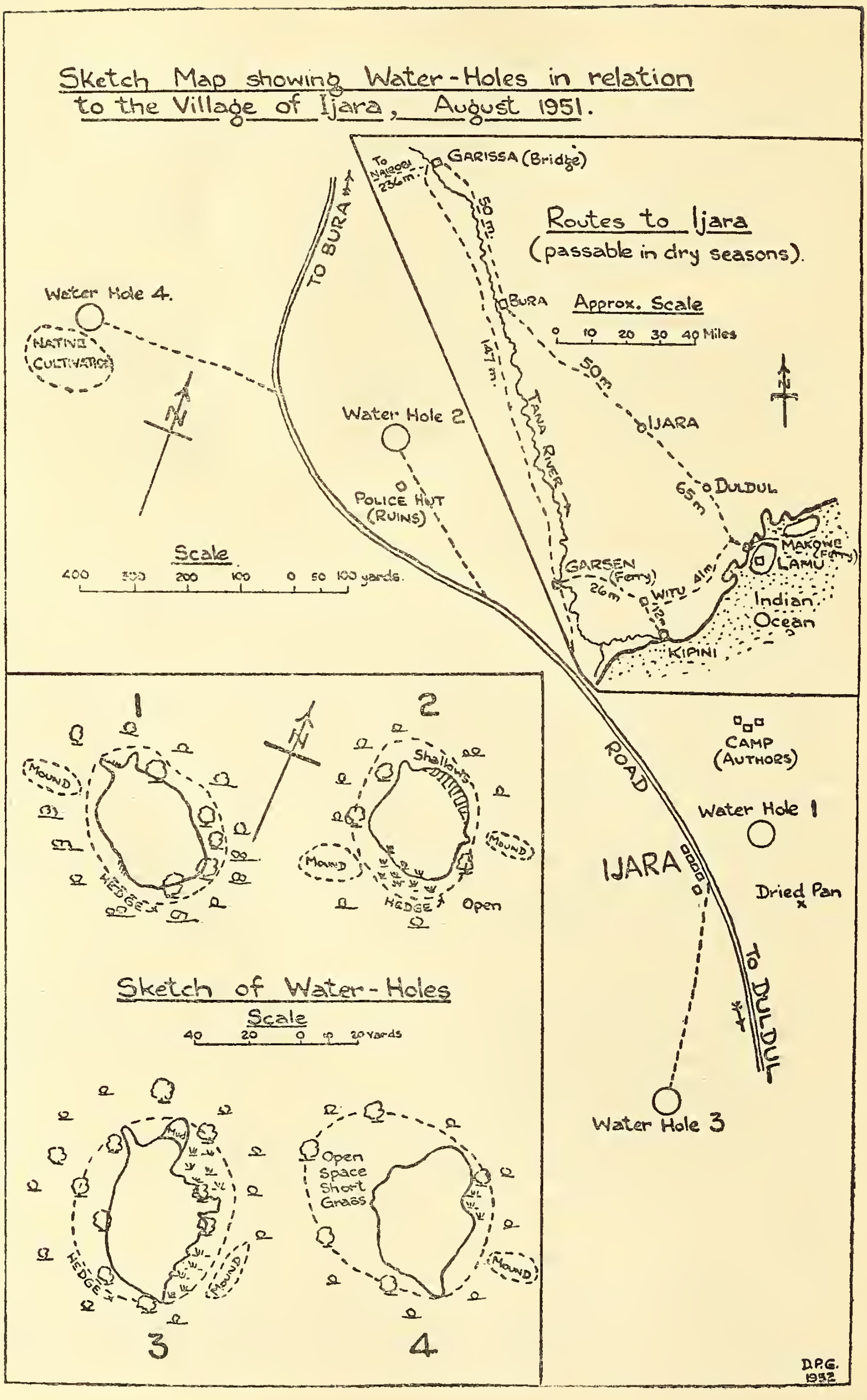
Copley, H. Small Mammals of Kenya. Nairobi.

Edwards D. C. (1940) A Vegetation Map of Kenya. With particular reference to Grassland Types. Journal of Ecology 28. 377

Goodrich E. S., (1930) Studies on the Structure and Development of Vertebrates. London.

Jackson, Sir F. J. J. (1938) The Birds of Kenya Colony and the Uganda Protectorate. London.

Swynnerton G. H. and Hayman R. W. (1950) A Check List of the Land Mammals of the Tanganyika Territory and the Zanzibar Protectorate. This Journ. 20 No. 6 and 7 (90).


Sketch Map showing Water-Holes in relation to the Village of Ijara, August 1951.
Routes to Ijara (passable in dry seasons).
Approx. Scale
0 10 20 30 40 Miles
GARISSA (Bridge)
To NAIROBI 236m.
50 m.
BURA
147 m.
50 m.
IJARA
TANA RIVER
65 m.
DULDUL
GARSEN (Ferry)
26m
WITU
41m
MAKOWE (Ferry)
LAMU
Indian Ocean
KIPINI
TO BURA
Water Hole 4.
NATIVE CULTIVATION
Water Hole 2
POLICE HUT (RUINS)
Scale
400 300 200 100 0 50 100 yards.
ROAD
CAMP (AUTHORS)
Water Hole 1
IJARA
Dried Pan
To DULDUL
Water Hole 3
Sketch of Water-Holes
Scale
40 20 0 10 20 yards
1
MOUND
HEDGE
2
Shallows
MOUND
Mound
HEDGE
Open
3
Mud
HEDGE
MOUND
4
Open Space Short Grass
MOUND
D.P.G. 1952

The Village of Ijara

Vegetation and Inhabitants.

Water-hole I.

Water-hole II.

Water-hole II.

Water-hole III.

Water-hole IV.

Nest of Juba Little Purple-banded Sunbird.

ELEPHANTS IN THE MOONLIGHT

by W. H. G. Grant.

EARLY in October this year (1952) I had my first chance after forty years in East Africa of observing wild elephants at very close quarters. My son, who has a roving job in South Masailand, met me in Arusha to take me into camp for one night. His battered safari truck was ready loaded with an equally battered minimum of camp kit. We scorched along the fine Stirling Astaldi tarmac road at a speed which terrified me in view of the vehicle's condition.

At Longido we spent some time depositing hitch-hikers and leaving sundry messages of an official nature; then, already belated, struck the track for Kitumbene Mountain, our destination. This track breaks off the Great North road to the west four miles on the Namanga side of Longido, and for the first 19 miles does just deserve the name of track. After leaving the now abandoned magnesite mine, we drove dead into the setting sun for another 19 miles over a narrow strip of country, from which some of the thorn bushes and larger stones had been cleared.

Just at dusk we reached a spot where large *Acacia spirocarpa* trees and the only green grass seen for many miles, marked the pools at the mouth of the pipeline bringing down the water of the Olgedju Longishu from its gorge four miles up the mountain into the arid steppe. This pipe is a Masai Tribal Authority work of great utility and value.

Kitumbene is one of the so aptly named "Inselberge" of that grand tract of country between the Rift Valley wall and Kilimanjaro. Some others of these island mountains in their ocean of bush and grassland are Gelai, Burko, Mondul, Essimingor and Ol-donyo Lengai.

We found a Dutch stock inspector already camped at the pipe line. He had arrived the day before us, and had spent a restless night. He had had no sleep on account of elephants round the camp, and he warned us that we would get none either. At this time of year the country is dry for many miles, except for the little streams which rise in the dwindling forest caps of the mountains.

The pipe at Kitumbene ends on a ridge of open bush, and a constant flow of clear, cold water, gushing out, is led by small furrows to a series of artificial ponds dug by Wambulu, employed by the Masai. There was copious spoor, and droppings of elephant and rhinoceros at the ponds; but all round the pipe mouth the ground for 30 to 40 yards was a foot-step mass of elephant dung. This gave one an idea of the numbers that must come to the place every night, and we anticipated an interesting experinece Nor were we disappointed. Fortunately the moon was full and the sky clear. At 9.30 the first arrival was a single rhino; but he was evidently shy and watered well below the camp. Little was seen of him.

At 11 p.m. the boys roused us to see a large herd of elephant approaching the ponds. These too were suspicious and did not come very close; but for some time were seen clearly silhouetted against the sky. It was

about 3 a.m. when the real show began. Again the boys woke us, and hurrying out of bed in pyjamas we found some twenty elephants already in the nearest pond, ten yards behind our tent. They bathed and squelched round in the muddy water, ignoring us, our tents, cars and camp fires. The wind certainly was directly in our favour; but at ten yards range even elephants could not fail to see all the strange objects. Thirst obviously accounted for their fearlessness. There was nothing but a light thorn screen between the herd and us. One cow had a very small calf; it could not have been more than a few days old. She was the only one of the herd who looked like being unpleasant. She spread her ears and advanced a few steps in our direction, but to our relief, thought better of it and moved off with the rest. It seemed that the cattle-fouled ponds were used by the elephants for bathing only; for drinking they wanted only the clean water where it actually left the pipe, or in the furrow heads a few yards from it. Here the herd crowded round. milling and shoving each other in their impatience for a turn at the water. The bright moonlight shone on their great wet bodies, and, seen through glasses, even their eyes were visible.

A big bull with one broken tusk (no big ivory was seen) may have been the father of the afore-mentioned baby. I saw its mother lead it up to this bull, who felt the calf over with his trunk, and then lurched away into the dark. I could almost hear him say to the mother "Not a bad youngster, but do keep him to yourself".

A little later another bull appeared from down wind of the camp; and despite a fire not many yards away, stood to drink at one of the furrows. This animal undoubtedly both winded and saw us all, but must have been so thirsty that he did not care. We put out the fire, and I crept up to within 19 yards of him (measured next morning) as he stood and drank. The water in the furrow was only a couple of inches deep so that the elephant had difficulty in filling his trunk. Having filled it, he lifted his head high, curled the trunk into his mouth and squirted the water in; then, with a still further lift of the head, he swallowed. Between each trunkful the elephant swung his head and forepart round to look at me, his ears out like tent flies, but his feet never lifted from the ground. When satisfied at last, he quietly glided off between the cooking pots left outside the kitchen hut, and disappeared without breaking anything.

Next morning before breakfast we took the truck up the mountain track which had been used in laying the pipe line, left it at the intake, and climbed a steep stone-covered ridge to view the forest cap of Kitumbene through glasses. There is still much fine cedar (*Juniperus procera*) left; but fires are regularly eating in and it is but a matter of time before the forest is gone. The lifegiving streams will then become irregular in flow, flooding uselessly in the rainy season, and dwindling to a trickle in the dry. Heavy expenditure on the pipe line will then have been in vain, and thousands of acres of grazing below in the steppe will be lost to the Masai.

Efficient fire protection is the most urgent need, but unfortunately this does not appear to be appreciated by the Masai Administration. Forest guards, fire breaks and early burning are essential, if the Masai of posterity are to inhabit the " Inselberg " terrain.

My son drove me to Namanga Hotel, where I caught the bus to Nairobi, after an unforgettable experience, which could not be surpassed by an expensive visit to any of the famous game haunts such as Amboseli or Mzima Springs.

SHORT NOTES.

GREY PHALAROPE IN KENYA.

The following note has been received from the Hon. Matthew W. Ridley.

" I think it may be of interest to record that on 17 February 1953 I saw a Grey Phalarope (*Phalaropus fulicarius*) on Lake Elmenteita. The bird was swimming about near the shore at the southern end of the lake and I watched it at short range and could clearly see the thick bill. Although I have never seen this species before, I know the Red-necked Phalarope very well and am in no doubt about the identification."

This would appear to be the first record of the Grey Phalarope in East Africa, although it occurs in numbers during the northern winter in the Gulf of Aden.—Ed.

SPOTTED REDSHANK IN KENYA.

On 8 February, 1953, in company with Sir Charles F. Belcher and Mr. A. J. Lewis, I succeeded in collecting a first-winter male Spotted Redshank (*Tringa erythropus*) on Simini's Dam, South Kinangop plateau. What was probably the identical bird was observed on the same dam a few weeks previously.

In the field the Spotted Redshank (in winter plumage) is not unlike a slim Greenshank in general appearance, but with legs and base of bill bright orange-red; it lacks the Common Redshank's white wing patch. The call-note of the Spotted Redshank when disturbed is characteristic, a *double* liquid " tuoo." Messrs. Praed and Grant (Birds of Eastern Africa) do not record this species from Kenya Colony.

John G. Williams;

Coryndon Museum, Nairobi.

SOME EAST AFRICAN HAWK MOTHS

By Lt.-Colonel C. H. Stockley.

HAWK Moths had a great attraction for most of us as boys, and in later days continue to interest through their distinctive appearance and wide distribution; while their erratic appearances in some years and complete absence in others, whose advantages seem to be similar, give us innumerable minor problems to work out through observation. Thus those of us who carry on collecting outside England find old friends turning up thousands of miles from where we first met with them.

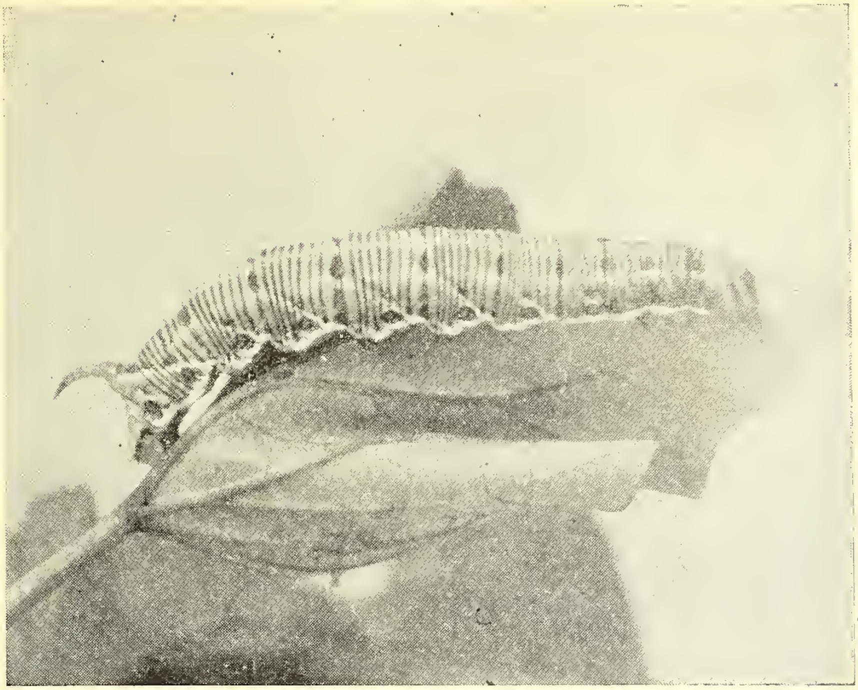
In East Africa the number of hawkmoth species is far greater than in England, and I have taken 24 different ones in my garden at the foot of Mount Kenya; most of them are attractive in appearance, and have distinct habits and markings.

Thus the big Death's Head, a skull clearly marked in yellow on its dark brown thorax, is not only an inhabitant of much of the world's surface but has two colour forms of the caterpillar which feed on different plants, yet the moths which emerge do not differ. Take a caterpillar from a Sodom apple plant, and another from the potato plot, and it hard to believe that they belong to the same species. The larva, pupa and adult are all endowed with the power of making a squeaky, snapping noise, which is quite startling to the novice. The Death's Head moth, when settled on the bark of a tree, is very difficult to spot, and is a great exponent of protective colouration, its wavy dark and light brown streaks merging with the bark. The caterpillar was very common near Nyeri in 1951, feeding most destructively on potato foliage. The larva of this species and its near relations are easily identified through having a short and rough horn with a kink in it. Two near relations which one is most likely to encounter are *Euchloron megaera* and *Coelonia fulvinotata,* each of whom has a rough kinky horn on the caterpillar. *E. megaera* has deep green forewings and yellow and black hindwings; and although it is commonest near the Coast, I recently bred out a dozen or more of them at Nyeri. I have also reared a number of *Coelonia fulvinotata*, whose forewings are rather like those of the Death's Head, but strongly patched with white.

The most beautiful of all moths is the Oleander Hawk (*Deilephila nerii*), which I took in 1936 and never saw again until last year, when I took more on the wing at verbena flowers, and also bred out specimens. It is tinted in waves of dark and light green curves, shaded with grey and pink, the whole looking rather like the "dazzle" paintings of a ship protected against submarine attack. Though it is called the Oleander Hawk, I never found either moth or larva on that shrub, but have most often found them on a wild vine.

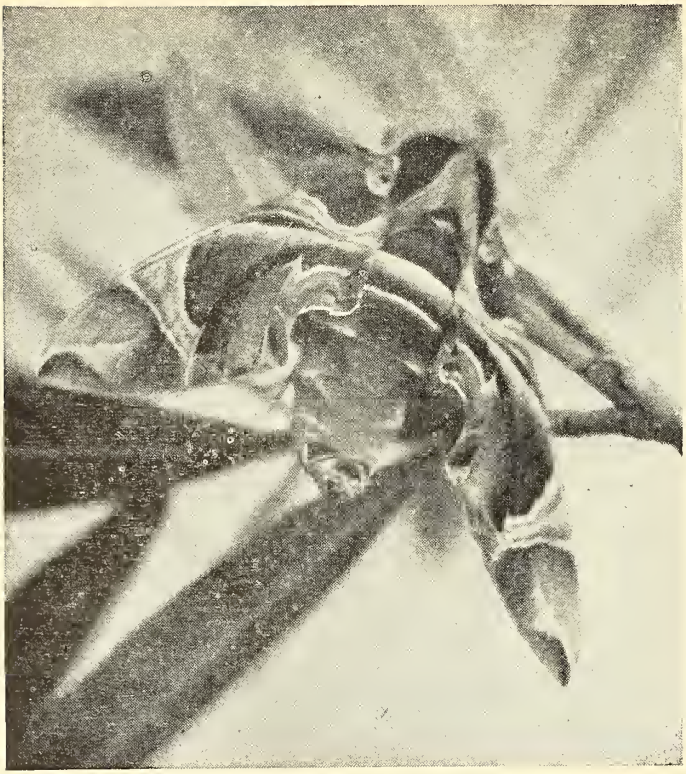
Another hawk moth, *Pseudoclanis postica,* did not turn up for several years, but then became fairly common. As the caterpillar feeds on new shoots of the commonest jungle tree which edges every road, one would have expected to have come across it much sooner. A large Hawk moth, pleasantly coloured in yellow and grey, its larva has a slender horn, gracefully curved, and very distinct from the larvae of the first group.

The commonest of all our hawk moths, and one of the larger species found in East Africa, is the great grey Convolvulus Hawk, which is blest



Larva of Convolvulus Hawk-Moth.
(Herse convôlvūlī).

Larva of Fulvous-Marked Hawk-Moth.
(Coelonia fulvinotata).



Oleander Hawk-Moth.
(Deilephila nerii).

Death's Head Hawk-Moth.
(Acherontia atropos).

with a sufficient long tongue to enable it to reach the bottom of the nicotiana flowers, so that a clump of these may have half a dozen grey phantoms hovering with a deep hum that can be heard a dozen yards away. Their bodies are barred with pink, and any time between sunset and dark a sweep of the net through the tobacco flowers whence this deep hum is heard may secure one or more of them, and the long tongue be examined with profit.

Fuchsias in verandah boxes are sure to attract an assortment of "Striped" Hawks, whose caterpillars are marked with an "eye" behind the head. Many of them come to light and dash about the ceilings of our houses, and far more are taken during daylight, settled inside the house. The larvae are mostly marked along the sides in continuous lines, and not with separate lateral oblique stripes; and the Striped and Silver-striped Hawks of this group are great prizes to be collected occasionally during a fine late summer in England.

There are many small hawk moths in East Africa which are not found in England, and have no "trivial" names. Some of them are handsomely marked and shaded in red, and one common one, *Basiothea medea,* has green forewings with orange hindwings, and is very plentiful at verbena and phlox. These are among the earliest sunset hoverers, and at times may even be seen in company with the Hummingbird Hawk Moth, so like our English *Macroglossa stellatarum.* There is also another day-flier, the pied *Leucostrophus hirundo.*

Our one large and obvious Beehawk is *Cephanodes hylax virescens,* which is also common in Southern Asia, and is much attracted by statice flowers : a handsome insect, with green and red body.

The absence of English names to our hawk moths is a great handicap to beginners; but Mr. Pinhey, our Entomologist at the Coryndon Museum, has written an excellent book on the commoner butterflies of Rhodesia, to which he has assigned English names; and I hear that he is about to do the same for East Africa. I hope this is true, for beginners need encouragement, and to those without a classical education the absence of names in their own tongue is a serious handicap. Brigadier Evans, the world authority on skippers, wrote a most useful book on the butterflies of India, supplying them with English names which he collected from those in use in schools, and furnishing it with a key. It is invaluable, and has enabled many boys to make a sound start with collecting. Let us hope that Mr. Pinhey will be able to do the same for East Africa, though the rearrangement of the Coryndon Museum collection, with much new work on the "life study groups," has filled his working hours to repletion for the last two years.

Perhaps some local entomologist will start on the Hawk moths, and then on the large and handsome *Saturniids,* whose larvae in some years swarm on our roadside trees. It is even possible to plant part of one's garden with a view to harbouring both these big groups. For the trees involved are mainly those we already plant for ornamental purposes (e.g. Pepper Tree), while the flowers which attract hawk moths are statice, nicotiana, petunia, phlox, fuchsia and salvia, already welcome settlers anywhere.

HUNTING SHELLS ON THE COAST OF KENYA

By Jane Bailey.

OFF you go, prepared to get really grubby and damp, with an extra container for minute and breakable shells, and a knife to investigate holes in rock and sand; this will save many a sore finger.

Now what does your reef offer? If dead coral and rock abound, search all nooks and corners and turn over anything that is moveable. Small and large cowries should come to light. There are many species of these, most of which are common, but you may find a rare one or two, and these have quite a high value. Small Turbo pyramids, mother of pearl, with pink or cream bases should be here, also the red-brown Cymation, with its outer hairy covering. Above the water line on the rock face you will find the duller shells, such as Limpets, periwinkles, chitons, rock murex, oysters and barnacles; but among these varied types nice specimens can be found. Cockles and mussels love the mud between the rocks and sea, and incidentally, cockles are very thirst quenching; also bi-valves of many kinds and many of the smaller snail types of shell, though most of the latter will have lost their original owners and have been taken over by small hermit crabs. If the reef is fringed with mangrove trees, it is worth looking under the leaves for minute snails attached by sticky threads.

If mud and weed or muddy sand abound, look for the foliated murex or spindle shell, with its beautiful branching arms and slender stem. Scallops of every shade can be found, mauve, yellow, brown and bright red are the commonest. The whelk; the fig shell, which is rare and looks just like a fig; the varied scorpion shells; the elephant's tooth, which is a small slim horn; the *Cassis rufa*, or cameo shell; large cowries; spined oysters; sundial or Architectonicia shell; hatchet cones with blue or pink interiors and cones are all to be found here.

Always investigate lumps of blackness in these parts, for so very often they prove to be lovely shells. Most of the shells in such an area have a muddy coating, especially the cones, which need scraping as soon as they are found. Don't forget that though most cones are harmless, quite a few of them have a very bad sting, and as a precaution, I pierce the animal as soon as I find it, and never put my hand on the barb which lies at the narrow end of the aperture.

Maybe in your wanderings you will find a mauve leathery growth among the flatter rock formations. This always yields good results if you lift up the flaps on the outer edge, for here many a precious specimen takes shelter.

Should you have a sandy reef, look for long snaky trails, and dig a knife's blade down at the trail end. There is generally a small hump showing where the shell has buried itself. This method has been known to produce many a beautifully marked Thereba, or Auger shell, also Turrets and Olives of shades of grey down to chocolate brown. Bubble

shells, the pure white polinices, large red mitra, a host of minute augers and small transparent shells can be obtained by this method.

Living coral is a camouflage for some of the loveliest specimens. Here you will find the harp shells, the white milk cowrie, and don't forget that the latter covers his whiteness with a black and red spotted mantle, so only a streak of the white shows. Larger cowries also love coral, and it is worth while to turn over any movable coral heads. You may find the mermaid's ear, which has the appearance of half a shell with holes drilled down its side. These help it to float and exclude a surplus of water.

Diving in deep water may produce beautiful trumpet shells or conches; the trochus, which is small in our waters; the African Green Snail, from which Kenya buttons are made; the pearly nautilus, which is very hard to get intact; and the *Cassius cornuta,* which Kenya people love as a door stop or a lamp holder.

Do not collect dead shells unless to keep as a specimen until its live counterpart can be found. Dead shells are useless from a true collector's point of view. Sunset shells and purple snails can often be collected intact from the shore on an outgoing or incoming tide, especially at Malindi. That rare shell may be awaiting you on the next rock; it did once happen to me; but the best specimens are camouflaged, and are not too difficult to find once one's eye becomes accustomed to the search.

So much for the daylight collecting; but should you wish to go further, take a pressure lamp on the beach at night. Choose a falling low tide, for then the shells are humping out of the ground to feed, and the light also attracts them. It is amazing how many can be collected, but don't forget to wear strong shoes, as the sea urchins also like to wander round, and maybe the stone fish "bevu" and young sting ray are out taking the night air.

So much for collecting, and now you have the shells at home, and they all have to be cleaned ! Don't lose heart. Pack your bigger specimens in a large box full of sand, and bury the box for four or five days. When you dig it up the smell will be overpowering, but the shells' inhabitants will have almost rotted, and a good rinse in a deep sea pool should clean them of all matter. If you want to be an expert, save all the opercula, or doors on the animals, scrape them clean and return each inside its correct specimen. Whilst speaking of opercula, it is a help to lever them up from the shell and insert a piece of wood or anything handy into the meat behind, then bury them, for a closely shut shell can hold out for a week as it retains its inside moisture. The next procedure is to place the cleaned shells in a shady spot for a day or two. The ants will finish any residue left inside, and the fresh air will remove any clinging aroma. Smaller shells can be pickled in weak solutions of methylated spirit or formalin without coming to harm. Two days should be sufficient; but your cones, Terebas, and any more of a similar spiral nature, will need a long thin needle or wire inserted to grab the animal's tail, which always seems to get left behind and causes such unpleasant results.

Now that all the shells are clean, boil some diluted Hydrochloric acid, one part acid to three parts water, and dip your shells in the mixture. Beware of dropping your specimens into the acid for only a skeleton will emerge. Have beside you a bowl of fresh water, and change this if it gets dirty. Dip, look and dip again, until you are satisfied, then plunge the shell into the fresh water. Take care that the inside of the shell is kept acid free, a wad of cotton wool helps here; but it must be removed on reaching the fresh water. The acid gives a bloom to your shell, and removes the outer skin from cones. A good collector cleans one cone and keeps another of the same species intact with the skin or epidermis.

Your shells, having been dried, are now ready for show case or box. Place a small piece of cotton wool at the base of the aperture for safety's sake, and the work is done. It's been hard, and you may wonder if it has been worth while; but forget your specimens for a week, and when you look again you will be very pleased with your work. So good hunting, and above all, good cleaning.

Letter to the Editor.

FLAMINGOES.

Sir,

I am trying to collect information on Flamingoes in East Africa, and I would be grateful if I could use your Journal to appeal for any notes on these birds which your readers may like to send.

In particular I would be extremely glad to receive information on the following points :

1. The breeding of either Greater or Lesser Flamingoes in East Africa.
2. Records of numbers of Flamingoes occuring on any lakes in East Africa at any time of the year.
3. Any evidence of migration to or from or within East Africa.
   I should be grateful if information could be sent direct to me.

Yours, etc.,

Sgd. M. W. Ridley,
Government House,
Nairobi, Kenya Colony.

10th March, 1953.

A KENYA ALNOITE AND ASSOCIATED SKARNS*

By William Pulfrey.

Abstract

A XONOTLITE-BEARING alnöite dyke and associated skarns, occurring in a limestone near Muhuroni, Kenya, are described. Micrometric analyses are given and the mode of origin of the rocks discussed. The conclusion is reached that the xonotlite of the alnöite was produced as a result of the assimilation of limestone in the dyke magma, but that the precipitation of melilite was independent of the assimilation.

Introduction. Alnöite is a rare basic dyke rock of the lamprophyre family found in alkaline provinces, and characterised by the lack of felspar and the presence of the lime-rich mineral melilite. It has been regarded as the hypabyssal equivalent of melilite basalt lavas, which though rare, are of more common occurrence. The type was first discovered in 1882 on the island of Alnö off the Westernorrland coast of Sweden; since then examples have been found at few places throughout the world, and alnöites may be accounted a petrological curiosity. The principal localities where they have been found are Polzen in Bohemia (where the alnöite was called luhite), Winnet in Montana, Avon in Missouri, Turij in North Russia, and monticellite alnöite at Isle Cadieux near Montreal. They vary somewhat in their mineral constitution, but are broadly comparable with the original alnöite, of which a modal analysis is quoted on a later page.

Melilite basalts have been described from several localities in Kenya —Mt. Elgon (Prior 1903, p. 250: Odman 1930, pp. 481, 489): Sigowet Hill, Seget valley, Lower Kedowa river, and Nyando river in the Nandi and Lumbwa districts (Prior 1903, p. 250); and near Fort Ternan station where melilite nephelinite also occurs (Maufe 1908, pp. 47, 49). They have also been discovered more recently by official geologists on the Legetet Estates near Muhoroni, and among the Pleistocene Nyambeni lavas of the Meru district. Dyke rocks containing melilite have, however, been described only from Mount Elgon where Odman (1930, p. 505) found two types, melilite nepheline basalts and bergalites, the latter being allied to the alnöites, but containing neither olivine nor pyroxene, and often having a glassy base. But until recently no true alnöite had been found in Kenya, though a rock allied to alnöite was described by Simmons some years ago from Elgon (1930, p. 39).

Towards the end of 1944 the writer discovered a small dyke of alnöite cutting Miocene limestones on the Legetet Estates, near Muhoroni (Fig. 1). The dyke occurs as a few small outcrops on the Northern slope of the limestone hill.

---

*Published by permission of the Commissioner (Mines and Geology), Kenya.

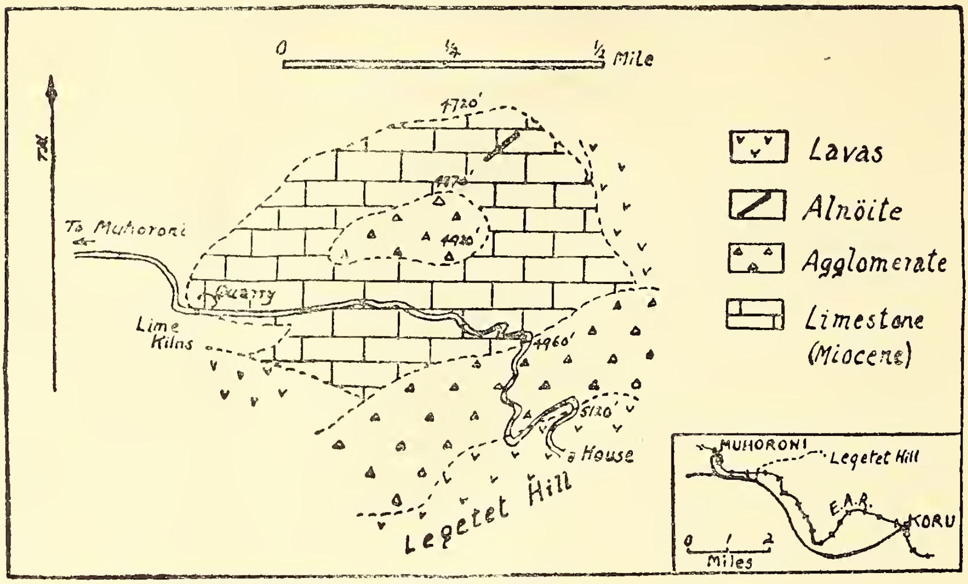


Fig 1. *Map of the limestone outcrops on Legetet Estates showing the position of the alnöite dyke.*

Exposure is not continuous, but the topographical expression of the dyke, in spite of the few upstanding outcrops, appears to be a shallow depression about 20 feet in width running through the limestone area. On either side of the linear depression the limestone forms low walls, on the northern of which skarns are exposed at the contact of the limestone and the dyke.

Lithology. The alnöite is a hard, dark grey rock, with abundant phenocrysts of dark brown biotite up to six mm. in diameter, and less frequent black pyroxene phenocrysts up to three mm. in length. The weathered surface is slightly brownish and rough with numerous small protuberances which are due to the superior resistance of the pyroxene grains to erosion. Some of the joints transecting the rock are lined with white or ironstained calcite.

The skarns are somewhat variable according to the amount of silication they have undergone. One specimen (WM 5)* is a dark grey, hard, fine-grained limestone with a 1½ inch wide band crowded with silicate crystals and magnetite grains up to 2½ mm. across, and with a more sparse scattering of silicate grains outside the defined band. On weathered surfaces the silicate appears dark and often of rounded form, some grains having a suggestion of dodecahedral shape. On fresh surfaces it is black and glassy, or sometimes brownish. Scattered among the dark grains there are also grains of recrystallized calcite up to three mm. in diameter.

* *Numbers prefixed by WM refer to specimens in the collection of the Geological Survey, Nairobi.*

Petrography. Thin sections have been made of the alnöite and the proportions of their minerals measured on a recording micrometer with the results quoted below. Analyses of other alnöites are given beside that of the Legetet rock for comparison. The percentages are volumetric.

ALNOITES.

	WM 1	A	B	C
	%	%	%	%
nepheline	6	Tr.	—	—
haüynite	—	Tr.	—	—
analcite	2	—	—	—
cancrinite	Tr.	—	—	—
olivine	1	5	11.5**	15.0
augite	14	17	6.8	13.8
biotite	22	30	36.3	26.1
amphibole	2	—	—	—
melilite (and alteration products)	17	33	18.7***	18.3
garnet	Tr.	—	—	—
apatite	Tr.	Tr.	6.9	5.5
magnetite	12	5	10.7****	9.0
pyrite	—	Tr.	0.7	—
perovskite	4	Tr.	3.4	4.7
xonotlite	20	—	—	—
calcite	+*	10	4.9	7.6
S.G.	2.95	—	—	—

*in melilite.
**pseudomorphs in serpentine.
***approx. composition Ak_{41} Ge_{59}
****" ores "

WM I. Alnöite. Legetet. Average of two thin sections.
A. Alnöite. Stornaset, Alnö, Sweden. Johannsen 1938, p. 381.
B. Alnöite. North-west of Stornaset, Sweden.
von Eckermann, 1948, p. 105.
C. Alnöite. South of Hovid, Sweden.
von Eckermann, 1948, p. 105.

The principal differences between the Legetet rock and the original alnöite will be readily appreciated — there is considerably less melilite and olivine, a larger proportion of magnetite and perovskite, an appreciable amount of nepheline, and a complete lack of calcite in the matrix, while there is a large proportion of the calcium silicate xonotlite. Some of these differences are not so marked, however, when comparison is made with the von Eckermann analyses. Most recorded alnöites or allied types contain much more olivine than the Legetet specimens, and the presence of xonotlite, which is normally an endogenous mineral found in

limestones near igneous contacts, has not previously been noted in them. On Stansfield's (1923) classification the present rock would be called a bizardite on account of its nepheline content. It is interesting to find that von Eckermann (1948, pp. 98-110) has described alnöites free of melilite, which has previously been considered as an essential constituent. In some cases however, he shows that melilite has originally figured in the rocks, but has been replaced by other minerals.

SKARNS

	WM 5 %		*WM* 6 %		*WM* 7 %	
garnet (large grains)	27.1	31.5	7.1	8.7	20.3	30.7
garnet (granules)	4.4		1.6		10.4	
magnetite	10.4		10.0		12.1	
pyroxene	0.5		Tr.		0.8	
biotite	—		Tr.		Tr.	
apatite	2.1		0.6		2.2	
zeolites	—		Tr.		1.8	
analcite*	—		1.1		—	
perovskite	Tr.		—		—	
calcite (by diff.)	55.5		79.6		52.4**	
S.G.	—		—		3.16	

*in a veinlet.

**including some hydrated iron oxides.

The variation in the size distribution of the garnet in the first and last examples is striking in view of the otherwise similarity of the analyses. It is equally remarkable that the second specimen, though much less silicated than the other two, has an almost identical iron ore content, suggesting that little of the iron introduced during metasomatism has been fixed as iron oxides. This is supported by a chemical analysis of nearby limestones showing 6.06 per cent Fe_2O_3, which would yield a little under 9 per cent of Fe_3O_4 (magnetite) on reduction.

In thin section the alnöite is a markedly handsome rock with its numerous poikilitic porphyroblasts of biotite (Fig. 2a). The rare *olivine* is fresh and clearly much replaced by the biotite, or more rarely, the augite, in which it is usually enclosed (Fig 2b). The largest grain was probably not much more than one mm. across, and most appears as rounded granules in biotite. It is colourless and optically positive, i.e. it is an iron-poor chrysolite. The *biotite* is sensibly uniaxial and has dichroism X pale straw (very rarely patchily light green), Y=Z yellowish brown, sometimes with a pinkish tinge. Most crystals are markedly poikilitic, but rare large crystals have inclusion-free cores, surrounded by intensely poikilitic outer zones. The biotite occasionally

fingers minutely into the enclosed melilites. The *pyroxene* is augite and occurs in crystals up to $3\frac{1}{2}$ mm. in length. Many are roughly idiomorphic, but the faces of the crystals are ragged, and occasional grains have fantastic shape indicating extreme corrosion. The crystals are colourless or pale green with weak pleochroism, X almost colourless, Y=Z pale green, or sometimes slightly yellowish. The extinction, $Z \wedge c$, is 54°, and the optic axial angle estimated from the isogyres is $+ 2V=60°$. Many crystals have an irregular outer zone with a few degrees difference of extinction from the core, though often there is no difference of colour between the two portions of the crystals. Occasionally crystals are multiple-zoned, again with no colour differentiation. More rarely there are overgrowths, a core crystal having different orientation from apparently similar augite that has enclosed it. Some crystals have narrow oblique zones of polysynthetic twinning. Many are replaced irregularly at their margins by pale green amphibole. Inclusions consist of iron ore, occasionally nepheline, and biotite, some crystals being markedly "sieved" by the last. On none, however, have biotite coronas developed.

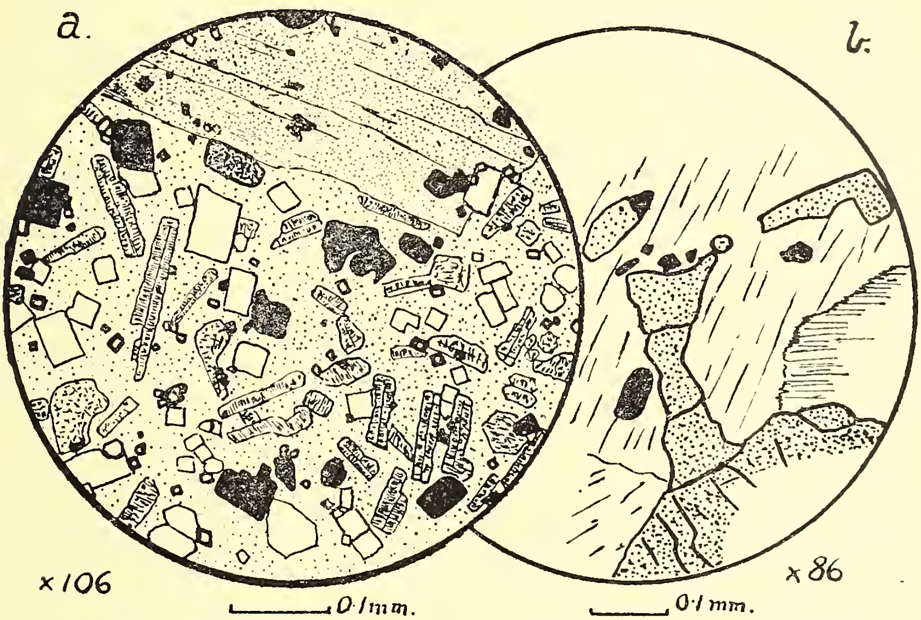


FIG 2. *Microscope drawings of a thin section of the alnöite, Legetet Estates. WM 1.*

a. Augite in upper part. The remainder of the field is a poikilitic biotite crystal (wide stipple) enclosing idiomorphic nephelines (white), corroded melilites (central crack and lines), perovskite (heavy borders or heavy stipple), and magnetite crystals and grains.

b. Olivine (stipple) enclosed in biotite. The separate fragments of olivine are in optical continuity.

The *melilite* occurs as colourless or, when altered, yellowish tablets, which are most conspicuous when enclosed in biotite, though they also occur elsewhere. The melilite rarely encloses nepheline or is enclosed by it, but none was seen included in the augite. Most sections are narrow oblongs, but some rounded hexagonal or irregular basal sections are also present. The oblong sections always exhibit a central basal cleavage, with, at right angles to it, numerous fibres of an alteration product which may be partly juanite, a hydrous lime magnesia alumino-silicate (Larsen and Goranson 1932, p. 354), but which is probably largely calcite, as the rock effervesces patchily with dilute hydrochloric acid though no recognisable carbonate can be seen in the slides. The degree of replacement by the fibres is variable and is sometimes complete. No peg structures were observed. The crystals vary in size up to 0.3 mm. diameter and 0.03 mm. thickness and are often somewhat corroded, and on occasion intensely. Optically the crystals are negative, and exhibit blue grey or light grey normal interference colours. The maximum birefringence measured was 0.0062, suggesting a composition, in simplest terms, approximating 75 per cent gehlenite, 25 per cent akermanite, and that the molecule is poor in ferrous oxide (Tilley 1929, p. 350). The crystals are apparently unzoned.

Nepheline occurs as square, oblong, or more rarely hexagonal idiomorphs, which again, though they occur elsewhere, are most conspicuous when enclosed in biotite. Some crystals in biotite have their edges well-rounded, and others in the xonotlite matrix of the rock are ragged remnants of original crystals. Occasionally grains occur in the pyroxene. The prisms generally range up to 0.1 mm. in length and are rarely as much as 0.2 mm. The crystals are clear except for occasional small doubtful inclusions.

The *xonotlite* forms a matrix for the minerals mentioned previously, and occurs as radiate fibrous and tufted aggregates. Optically it is positive with small optic axial angle, and has straight extinction and positive elongation. The birefringence is between 0.010 and 0.015, and the refractive indices lie between 1.56 and 1.61, one being a little over 1.5855.

The *pervskite* is mostly present as sharply idiomorphic octahedra up to about 0.45 mm across, but also as irregular grains up to 0.15 mm. When small it appears colourless, but larger grains are brownish yellow, or rarely the more characteristic pinkish brown tinge of perovskite. It is usually anisotropic though without lamellar twinning; smaller grains appear to be isotropic. Rarely it is enclosed in magnetite, and in one case it was seen to have moulded on nepheline and to have penetrated between that mineral and biotite.

Magnetite occurs in grains and octahedra up to 0.1 mm. across, lying in all the other minerals, though often the pyroxenes are devoid of them or have magnetite grains developed only along their edges. Occasionally it occurs as thin seams lining nepheline-biotite contacts, and forms partial coronas around perovskite crystals. Clouds of minute granules are also present in places. *Apatite* is present as small slender prisms in the biotite and as rarer stouter grains associated with analcite. Only one doubtful

grain of *garnet* was noted — a light brown melanite type, enclosed in biotite.

The *analcite* forms colourless isotropic interstitial patches up to 0.3 mm. across (cf. Bowen 1922, p. 31; von Eckermann 1948, p.99). Associated with the analcite and xonotlite are small patches of a *cancrinite*-like mineral. It is uniaxial and negative, with moderate bifringence.

The remaining mineral of the alnöite is the *amphibole,* which is fibrous and secondary, and occurs mainly as fringes on the augite, though small isolated tufts and fibrous crystals also lie among the matrix minerals. The colour is variable, pleochroism being X light green, Z pale green or X bluish green, Z light green. The extinction is $Z \wedge c = 24°$.

Paragenesis of the alnöite minerals. Several of the minerals present corroded outlines towards the biotite and there can be no doubt of its late development. The general scheme of crystallization of the various minerals may be set out as follows, overlap of the mineral names indicating overlap of their period of formation—

olivine
augite — perovskite
nepheline — biotite — ? magnetite — xonotlite —
melilite
cancrinite
— analcime

The position of the melilite may be contrasted with that of the St. Monique (Quebec) alnöite (Stansfield 1923, p. 437), in which it is represented as being later than the mica, and without idiomorphic shape. In the alnöitic rocks of Polzen melilite crystallized prior to the pyroxene, sometimes to its exclusion (Stansfield 1923, p. 449).

Minerals of the skarns. The skarns have a much simpler constitution than the alnöite. Textures are granular and crystalloblastic, the *carbonate* forming a matrix for the other minerals. Much of it is fine-grained granular and dusky, but some has recrystallized as coarse, clear grains.

The most striking feature of the *garnet* is its occurrence in two generations, as megascopic grains, and as minute crystals and grains which often occur as profuse clouds in certain portions of the sections. The granules are yellow or dusky and usually idiomorphic or "rounded," ranging between 0.006 and 0.03 mm. in diameter. There is occasionally a suggestion that macroscopic garnet grains have been formed by the coalescence of granules. The large grains are variable in shape ranging from idiomorphic to angular non-idiomorphic. The colour is also variable; most grains have a colour between light yellow and strong yellow, but there are occasional brown crystals and others are colour-zoned. Some grains have incomplete brown borders, but occasional grains have brown cores and rarely crystals have well-developed multiple zoning in browns and yellow-browns. Frequently zoning ends abruptly at the sharp edge of a grain, and it is concluded that many of the grains are fragmental. Fragmentation can be seen in some cases, the spaces left by the parting of fragments

being filled by clear recrystallized calcite. Some of the garnets contain numerous inclusions of apatite or pools of calcite. This is best seen in a large crystal in slide WM 5 in which the incomplete outer pale zone is crowded with apatites, the darker zoned core having few. In another case garnet has penetrated apatite in irregular growths.

The refractive index of a specimen of the garnet was kindly determined by Mr. J. F. Robinson of King's College, Budo, as 1.886 (at 22°C), indicating that it is a yellow andradite (though probably containing a little of the grossularite molecule), and where brown a titaniferous andradite, perhaps in the extreme even melanite. It is mostly isotropic, though occasional grains are birefringent along cracks.

The *magnetite* of the skarns varies from idiomorphic to irregular in shape. Occasional grains have been fractured and subsequently healed by calcite. Some include small apatites and patches of calcite, and are themselves rarely included in garnet.

The *pyroxene* is scarce, and insufficient is present for accurate determination of its identity, but it is possibly an aegirine-augite, most of it being notably pleochroic from light green to yellow green, though rare grains are almost colourless. The optic axial angle is 80°. Though occasional porphyroblasts remain entire, most of it consists of much-resorbed relics, and some is partly replaced by dusky calcite. One grain in slide WM 6 is surrounded by a corona of garnet granules (cf. Iron Hill uncompahgrite, Larsen 1942, p. 10) and is much darkened by secondary iron ore.

Apatite is a common accessory, and is occasionally large. It is often irregular and frequently enclosed in the garnet, but more rarely in magnetite and pyroxene. Some occurs in pools of recrystallized calcite, and larger grains enclose shreds of calcite.

Biotite was found as small crystals, as small aggregates of crystals, and as scattered shreds. The colour is variably light brown or green. *Perovskite* was noted in only one slide where it occurs as small pinkish brown crystals. The *zeolite* present is generally indeterminate though possibly in one case, where associated with calcite in a veinlet, it is natrolite. The *analcite* also occurs in a veinlet.

The paragenesis of the main introduced or recrystallized minerals of the skarns appears to be—

apatite — pyroxene

—magnetite.

garnet

The possibility of the long-continued crystallization of the garnet is indicated by the large zoned crystal containing apatite inclusions mentioned above.

Petrogenesis. The question of the mode of development of the alnöite is best approached through that of the skarns. The chemical composition of the unaltered limestones not far from the dyke is known, and may be roughly translated into percentages of minerals as — calcite 85%, hydrated

iron oxides and manganese oxides (mainly iron) 9½%, apatite 3%, silicates 2½%. The nature and amount of the materials introduced to form the skarns can be accurately known only when the garnet has been analysed. In view of the minerals formed, however, it can be reasonably assumed that the principal radicles introduced were SiO_2 and Fe_2O_3. These together with lime from the limestone gave rise to the garnet, carbon dioxide escaping. Titanium must also have been introduced to form the melanitic garnet, as there is little titania in the limestones. It is probable too that a small amount of soda passed from the dyke to its walls, assisting in the formation of the small amount of soda pyroxene and zeolites.

The zoning of the garnets of some of the skarns is taken to indicate pulsatory motion of the materials deriving from the dyke. It is also further indication that the titania required for the more melanitic portions of the crystals was most often not derived by abstraction from the limestone.

The fragmentation of the larger garnets is considered as having arisen by mechanical disruption of the dyke wall rocks after their formation, followed by recrystallization of much of the surrounding carbonate, so that fractures are no longer visible in it. The resorption and alteration of the pyroxene probably occurred at this stage. The small garnets of the matrix must then have been formed by the fluids from the dyke. An intermediate stage at which fracturing of the walls could occur may possibly be explained by the incidence of metasomatism of the limestone ahead of the dyke and along a fissure up which it was forcing its way, fracturing taking place when the dyke moved up into the already permeated zone.

Turning to the alnöite, there is no indication that it did not initially crystallize from an alkaline melt or a mixture of melt and crystals. The presence of a considerable proportion of xonotlite ($5CaSiO_3.H_2O$) and perovskite suggests, however, that during emplacement limestone was assimilated. The presence of melilite would also be taken by some authors (e.g. Simmons 1930, p. 40) as indicating that limestone had been assimilated, but as Bowen has shown (1928, p.267), that is not necessarily true. In fact, if it is assumed that the original magma concerned was of a type suitable to crystallize as nepheline basalt, as seems reasonable from the general constitution of the dyke and the nature of lavas of the same volcanic sequence, there would be sufficient lime available to account for all the melilite. The nepheline basalt of Fort Ternan, for example, contains 11.96% of Ca0 (Johannsen 1938, p.343), whereas it can be calculated that the lime in the alnöite, exclusive of that held in xonotlite, is probably not far from 11%. Nevertheless there is no doubt that in some cases the solution of limestone in magmas has led to the production of melilite rocks (Tilley 1929).

Bowen (*loc. cit.* p. 259) has shown that in the case of alnöites from Quebec and Montana there is " no evidence . . . that there was ever a liquid corresponding in bulk composition with the final product." In the case of the first he indicated that the rock consisted originally mainly of

olivine and augite, which were then attacked by an alkaline fluid, in part at least the interstitial liquor, leading to replacement by biotite, monticellite, melilite and perovskite. In the present case it seems probable that a similar process has taken place, the alkaline fluid being the residuum after crystallization of olivine and pyroxene, though the possibility of a flux of materials from the parent magma cannot be disregarded. The alnöite must, however, contain roughly the same amount of potash as the nepheline basalts of the area, and it seems unlikely therefore that an accession of new alkaline liquid was necessary for the reactions to take place, the residual liquors of the original magma being sufficient for the purpose.

The process of evolution may be conceived as having taken the following steps :—

1. The original magma is assumed to have been the equivalent of nepheline basalt, which on intrusion consisted of crystals of olivine and probably pyroxene in a basic alkaline fluid. (It should be noted that the Basement System lies at shallow depth below the Miocene deposits on the Legetet Estates, and the magmas that gave rise to the lavas and dykes must have passed through it, but there is apparently no sign in either the effusives or the dyke that the magmas were affected by it).

2. After emplacement in the lower part of the dyke-chamber augite would continue to crystallize, olivine being resorbed during the process. At the same time the composition of the remaining liquid would become more and more alkaline until nepheline could precipitate. Before nepheline had completed its crystallization the temperature of the mass was sufficiently decreased for melilite, probably containing an appreciable proportion of the soda-melilite molecule, to begin to precipitate, nepheline and augite being resorbed concurrently. The latter reaction would lead to a re-introduction of magnesia and titania into the liquid, on release from the augite. The liquid remaining would then be a water-bearing solution containing mainly $(K, Na)_2O$, Al_2O_3 and SiO_2

3. During stage 2 and as the liquid became more alkaline, limestone would be dissolved from the walls of the dyke, leading to an enrichment in lime, most of the CO_2 escaping.

4. At this stage reaction would begin to take place between the already precipitated crystals and the residual liquid. Biotite, as can be seen in the slides, replaced olivine, augite and melilite, and to a less extent nepheline. The reactions may be considered individually as they concerned each mineral —

a. olivine — biotite would form by the addition of $(K, Na)_2O$, Al_2O_3 and H_2O from the liquid, with expulsion of some MgO and FeO.

b. augite — biotite would form by the addition of $(K, Na)_2O$, Al_2O_3 MgO and H_2O, with the liberation of SiO_2, CaO, Fe_2O_3, and perhaps TiO_2

c. melilite — biotite would form by the addition of $(K, Na)_2O$, Al_2O_3 $FeO(Fe_2O_3)$ and H_2O, with the liberation of CaO.

d. nepheline — biotite would form by the addition of K_2O $FeO(Fe_2O_3)$ and H_2O, with expulsion of Na_2O and Al_2O_3.

No precise evaluation of the net result of these exchanges can be made without knowledge of the chemical compositions of the minerals, and the amounts of each originally present. But it may be reasonably supposed that the solution from stage 3 would now have exhausted its supply of K_2O and probably of most of its Al_2O_3, but would have become still more enriched in CaO, together with enrichment in FeO (Fe_2O_3), SiO_2 and TiO_2 there being little change in the Na^2O content. The enrichment in silica would account for the intense corrosion of some of the nepheline in the ground-mass of the rock.

5. During the formation of the liquid of stage 4 the passage outwards of SiO_2, FeO(Fe_2O_3), TiO_2, and small amounts of Na_2O) and possibly a little Al_2O_3 in ionic form into the surrounding limestone is postulated. Reaction with the minerals of the limestone would lead to the formation of the garnet of the skarns, and the little sodic pyroxene would develop. Early in this process it seems probable that the apatite of the limestone was first brought into solution and then reprecipitated, while at a somewhat later stage the inherent iron oxides were recrystallised as magnetite grains. At the same time magnetite and perovskite would be crystallizing from the liquid in the dyke chamber.

6. From the liquid then consisting largely of a solution of CaO and SiO_2, the hydrated lime silicate, zonotlite, would precipitate until the solution was largely consumed.

7. The final stage is represented by the crystallization of the remains of the fluid in what "open" spaces remained, the products being concrinite and analcime, principally the latter. A little of the final fluid escaped into the walls where it crystallized as zeolites or as analcime in veinlets. It is assumed in addition that the replacement of pyroxene by hornblende also occurred at this late stage, when the temperature had fallen considerably, though there is no positive evidence to indicate in what part of the sequence it falls.

Such a process accounts for the unique constitution of the alnöite with its matrix of lime silicate and the constitution of the skarns, and at the same time supports Bowen's contention that a liquid excessively rich in lime is not essential for the precipitation of melilite.

References.

Bowen N.L. 1922. Genetic features of the alnöitic rocks at Isle Cadieux, Quebec. Amer. Jour. Sci., 5th ser., No. 3, pp. 1-34.

—— 1928. The Evolution of the Igneous Rocks. Princeton University Press.

Eckermann H. von 1948. The alkaline district of Alnö Island. Sver. Geol. Undersök., ser. Ca, No. 36. Stockholm.

Johannsen A. 1938. A descriptive petrography of the igneous rocks. Vol 4. Chicago.

Larsen E.S. 1942 Alkalic rocks of Iron Hill, Gunnison County, Colorado. U.S. Geol. Surv., Prof. paper 197-A.

—— and Goranson E.A. 1932. The deuteric and later alteration of the uncompahgrite of Iron Hill. Colorado. Amer. Min., 17, pp.343-356.

Maufe H.B. 1908. Report relating to the geology of the East Africa Protectorate. Col. Rept. Misc., No. 45, Cd. 3828. London.

Odman O.H. 1930. Volcanic rocks of Mt. Elgon in British East Africa. Geol. Fören. Förhandl., Bd. 52, H.4, pp. 455-537.

Prior G.T. 1903. Contributions to the petrology of British East Africa. Mineral. Mag., XIII, pp. 238-263.

Simmons W.C. 1930. A note on interesting nepheline and melilite rocks from near Mt. Elgon. Ann. Rept. Geol. Survey, Uganda, for 1929, pp. 38-40.

Stansfield J. 1923. Nomenclature and relations of the lamprophyres. Geol. Mag., LX, p. 550.

—— 1923. Extensions of the Monteregian petrographical province to the north and north-west. Geol. Mag., LX, pp. 433-453.

Tilley C.E. 1929. On melilite as a product of interaction of limestone and basaltic liquid. Geol. Mag. LXVI, pp. 347-353.

Nairobi, 1949.

THE INTRODUCTION OF THE AMERICAN BROOK TROUT (*Salvelinus fontinalis*) TO KENYA.

by HUGH COPLEY.

THE American Brook Trout (*Salvelinus fontinalis*) is the North American representative of the British Char, such as the Windermere Char (*Salvelinus willoughbii*). Really all chars can be considered as varieties of the Alpine char (*Salvelinus alpinus*). The chars can be distinguished from the Brown and rainbow trout by their coloration. The back is dark green becoming lighter on the side, to white on the belly, often flushed with pale pink or yellow. The back is covered with a marbling of short black lines, with sinuous lines of black, or rings on the dorsal fin, while the upper and lower caudal is barred. When swimming the conspicuous white line with a black base is seen on the forward edge of the ventral and anal fins. When ready for spawning the lower parts of the cocks are bright crimson. If identification should be still in doubt, an examination of the vomer bone in the mouth, will settle the question. In the trouts the vomer bone, often called the ploughshare bone, is completely covered with well developed teeth. This bone in the char is broader, shorter and only carries teeth at the end nearest the throat.

The reason for the introduction of this fish was as follows: There are in Kenya quite a number of farm dams situated from 7000 to 9000 feet above sea level which are rain fed, or fed by a small stream only running for a few months in the year. The water in these dams is far too cold to support a population of Tilapias. Also, since they have no access to gravel spawning grounds, trout in such dams will grow but will not spawn, often dying off when spawn-bound. In an article in a Swedish paper it was stated that in a number of lakes in Sweden char would spawn on the muddy side and the ova would survive and keep the lake stocked. Such a fish was just the answer to our problems, so we immediately got into touch with D. F. Leney Esq., of the Surrey Trout Farm, Haslemere, enquiring whether any eyed ova could be procured. Finally some American Char were found at the Wraymires Hatchery of the British Freshwater Research Station, Windermere. We were promised 2000 of these ova when the fish were stripped, if we would make all arrangements for getting them out. Mr. Leney took over all that part of the work, and the eyed ova came out to Kenya with the usual consignment of Brown and Rainbow ova in January 1949. They were hatched out in a Kashmire box, and by the time the Hatchery Superintendant arrived in March we had 1,731 fingerlings for him to look after. It was noticeable that these fingerlings would not take boiled egg yolk or fish, like the brown and rainbow fingerling; but would only take liver. We had a disaster in April when we lost 648 fingerlings choked by silt carried down by the river. At the end of December, 1949, we had 100 fish in the rearing ponds. We found the American char a far more delicate fish to raise than either brown or rainbow trout.

During 1949 we moved 151 American char to three stations for experimental purposes. Mr. Morson let us stock his dam at Ol Joro Orok with 44 fingerlings. and Mr. Baxendale lent us one of his dams, and this was stocked with seven fish on the 14th December, 1949. The main experiment, however, was made in Lake Hohnel at 14,000 ft. on Mount Kenya. If they did survive and produce stock, the idea was to stock all the high altitude rivers and tarns on Mount Kenya ready for the time when this area would be declared a national Park.

On the 1st of September, 1949, the Hatchery Superintendant, Mr. Martindale, started off with ten debes each containing ten American char 3″ long; two debes to a mule. The highest limit of the bamboos was reached at 14.30 hrs. and the debes were off loaded and placed in a mountain stream. After the water had been equalised, the fish were placed in two holding baskets, and left there for the night. The temperature of the stream water was 51°F. The following morning the fish were replaced in the debes, and Lake Hohnel was reached at 17.30 hours on the 2nd September, and 99 fish out of the 100 were safely released in the waters of the lake, which had a temperature of 51°F. On the morning of the 3rd September two fish were seen feeding happily in the shallows. The lake was closed to all fishing.

The 100 fish left in the rearing ponds at the Research Station grew well, just as well as the Shasta rainbows. On the 13th July, 1950, two females were found to be ripe and were stripped. This early ripening of the hens was a surprise, as the brown and rainbow trout of the same age would not ripen until their second year. In England and America these fish do not ripen until their third or fourth year. In all seven fish were stripped, yielding 242 fry in December, which were moved to the rearing ponds. All fish gave good ova in small quantities; but the cock fish gave very little milt.

In 1951 the great majority of the hens were spawn-bound, and only two hens gave a few ova each. The cocks also gave very little milt. We have a very few fingerlings left. Our experience is the same as that of German hatcheries — the first stripping is successful but subsequent strippings are of very little value.

On the 27th September, 1952, the Hatchery Superintendent went up to Lake Hohnel to see what was doing there. Although he could not catch a fish, yet he saw about five large fish rising. He saw no small fish nor any signs of spawning; but he found a dead hen fish, approximately $2\frac{1}{2}$ lbs. in weight, which had died owing to becoming spawn bound.

It can safely be said that the results of this importation are a failure owing to some defect in the environment. Dr. V. van Someren is of the opinion that the relative hours of light and darkness are wrong; i.e. that the fish get no winter periods, with short hours of day-light coupled with too high a water temperature. This failure is a great pity, as the American char is a bold, handsome fish, which would have filled an empty niche in the sporting fish of this Colony.

RIVERSIDE DWELLERS OF THE WHITE NILE

by Mary Myrtle Jaques-Aldridge

In the vast, steamy swamps which border the White Nile on its way through the Sudan are found various Nilotic tribes, and it is strange to reflect that it was not until three-quarters of the way through the nineteenth century that any reliable informaion at all concerning them existed. Much remains to be learned. The East bank is inhabited by the Dinka, the largest of the Nilotic tribes, while the Shilluk are found on the West bank. The Nuer occupy both banks of the river. All these tribes dwell in beautifully thatched, circular huts — many raised on piles above the swampy ground.

The territory of the Dinka extends over a vast area. It is everywhere flat, and largely swamp in the wet season — a terrain hard on man and beast. Totemism is strongly developed among these Dinka, i.e. the belief in a special relationship between a family group, or clan, and a certain animal, plant or other object. In the case of the Dinka the totem is usually an animal. If, for example, it is a crocodile, then the people of the group whose totem it is regard themselves as bound to the crocodile by ties corresponding to those of human kinship. It is tabu for any man to injure his totem animal, and many Dinka speak of it as their ancestor and refer to it in terms identical with those used for human relatives.

And what do they look like, these Dinka? In common with the other Nilotic tribes they are jet black and the men are unusually tall — about six feet three or four inches; some have been known to attain a height of seven feet. They are very thin, with spindly legs. Sometimes they look really terrifying, their faces daubed with white paint — war paint — wearing large earrings and carrying enormously long, sharp-looking spears. It is easy to believe that these warriors have no difficulty in striking their adversaries with terror. Their manners, however, are sometimes amazingly at variance with their ferocious aspect as, if one asks to take their photograph, they will giggle bashfully and pose charmingly — and then ask for baksheesh.

Some of the women wear silver bracelets from wrist to elbow, sometimes as many as thirty-nine on each arm. Others wear little or no jewellery and are clad in very drab-looking garments. These are probably married women as, once wed, they have no need to try and catch the eye of eligible young men and they relinquish their finery to their families and it may, perhaps, be worn by a younger sister when she reaches marriageable age.

The Shilluk, not nearly such a large tribe, unlike their neighbours across the river, who recognise no supreme chief, have a king who is absolute head and rules by divine right as direct descendant of Nyakong, the first Shilluk king. Like the Dinka they worship chiefly the spirits of their ancestors and, again like the Dinka, the Rainmaker is the most important member of the community. He has absolute authority and is recognised as being the earthly abode of the spirit of a great ancestor. When the Rainmaker becomes old, however, he is either buried alive or strangled and a new one elected.

The Shilluk have the reputation of being the best craftsmen of the river bank portion of the Sudan, for they are excellent thatchers and iron-workers. Beside canoes they use small rafts made of reed which resemble almost exactly those used by the ancient Egyptians. This would seem to support the theory that the Egyptians did, in fact, migrate South up the Nile.

The men of this tribe sometimes have a row of round scars, often very raised, like a string of beads, from ear to ear across their foreheads. Apparently these tribal marks are made at the age of about six years and the process of achieving them is primitive in the extreme.

A series of punctures is first made with a fish-hook, perhaps with the string attached, just as it has been used for fishing. Then a half-moon shaped incision is cut with a short, sharp knife, from one end of the fish hook punctures to the other. The blood runs down into the eyes, and is said to have a beneficial effect upon them and to cure all eye troubles, to which the natives are very subject. Soot, generally obtained from the bottom of a cooking pot, is finally rubbed into the wounds. The process may be repeated at intervals, as many as four or five times, until the desired scar effect is obtained.

The Nuer people are of the same common origin as the Dinka, who they despise for, they say with contempt, when they set out to raid the Dinka they leave their shields at home. Their system of totemism is identical with that of their Dinka neighbours, but they recognise no divine king, as do the Shilluk, and the Rainmaker has far less ritual importance. Instead they have a land chief who gives judgement in disputes, in collaboration with the old men.

Like the other Nilotes, much importance is attached to cicatrisation and their foreheads are deeply scarred by six horizontal lines, like exaggerated frown furrows. The incisions producing these scars are made on a scale not found in other peoples and have far greater social significance, for they form the basis of the initiation ceremonies.

Parents, friends and even young girls may be present at these ceremonies which are conducted in the following manner. The boy lies on his back with his head, shaved and annointed with grease, over a hole which has been dug to catch the blood. The operator squats at his right side and, with a small sharp blade, cuts outwards from the centre of the forehead, above the eyebrows up to well over the right ear, down to the bone. This is the main incision and is the most painful, as it severs the supra-orbital nerve. The next incision is made about a centimeter above the first, and so on, until six more or less parallel lines have been completed. The left side of the forehead is then treated in the same way. Great importance is attached to the boy showing himself courgeous, and they generally submit to this most painful operation with almost unbelievable fortitude. It would appear that this ceremony takes the place of the circumcision ceremonies of the East African tribes.

Some of the Nuer cattle present a very curious appearance, for they have the left horn trained across the forehead, while the right is trained to point upwards, in exactly the same way as those depicted in the

Shilluk — showing bead-like scarring of the forehead.

Dinka — wood-ash covering against insects

ancient Egyptian wall-reliefs in some of the tombs of Sakkara — another indication of the migration South of the ancient Egyptians.

It is habitual for these Nilotic tribes to go naked, their only adornment being beads — perhaps a string round the neck and another of the same colour round the waist. The fashion in the colours of the beads changes every few years. Many saunter about smoking long pipes, and the combination of nudity and a pipe is extraordinary. Many smear themselves liberally with wood ash as protection against the stings of insects.

The various hair styles of these people are very unusal. Some emphasise the hair-line with a band of orange chalk, probably brick dust, while others render their naturally frizzy hair quite straight, so that it stands out like a halo, and at the same time dye it red. This effect is achieved by plastering the hair and scalp with cow-dung, tying it up in a piece of cloth and leaving it for about three months. There daub a kind of white paste over their heads, the hair sticking up in tiny isolated knobs all over the scalp.

The women of the tribes, like the men, frequently go about completely naked. Some present a very startling appearance, with their heads shaved except for a strip of longish black hair running from their foreheads across the top of their heads to the nape of the neck. The shaved portion is dyed red. Some wear small, thick, silver rings through their upper lips, and the variety of ornament seems infinite-bracelets formed from a round section of elephant or hippo tusk; strange necklaces of beads made from large seed-pods bound together with elephant hair; and some wear huge safety-pins through their ears.

One fashion among these riverside dwellers is particularly ugly, as well as most impractical. The upper front teeth are wedged in early childhood in such a way that they protrude from the gums at an angle of about ninety degrees. In addition they are sometimes filed too sharp points. These malformed teeth are a much coveted aid to beauty.

Many, man and women alike, possess a most pungent and unpleasant odour, due to their habit of bathing themselves in cow urine. They wash all their cooking utensils in cow urine too, and this acts not only as an antiseptic, but it makes up for the absence of salt in their diet.

Those who have spent their lives among these primitive Nilotic tribes have, perhaps unwillingly, been convinced that it is foolish to assume that every Pagan custom is rooted in savage ignorance and marked by complete disregard for all moral issues. The point of view of such people, as well as their reasoning, will of course be strange to Western ways of thought. There is ignorance, bigotary, and callousness• without a doubt. Many have been surprised however, at the fundamental similarity of outlook of black and white on major issues. To both it seems foolish to deny the existence of a Creator Deity; and the faith of the black is, in all probability, more vivid and unquestioning. To both justice is an ideal and the maintenances of law and order among a community desirable, if not essential.

THE HOUSE OF THE DHOW.

by JAMES KIRKMAN.

The private houses of Gedi, lying between the Palace and the east boundary wall of the city, follow a standard plan consisting of a sunken forecourt and a long front room with doors leading into two suites of two rooms each. The structure known as the House of the Dhow, which was excavated last year, follows the traditional plan, but with the addition of an inner court. Part of this building goes back at least to the beginning of the period of rehabilitation of the city in the early 15th centruy. It remained in occupation until the end of the 16th century, when, from the absence of characteristic late ceramic types, it appears to have been abandoned, rather before the end of the life of the city. During this span of two hundred years it underwent alterations and additions, reflecting vividly the vicissitudes of a builiding lived in by generations, each with their needs and problems. Finally, as "the conclusion of the matter", the large tomb was built at the north-east corner of the building where the last owner rests undisturbed. This is the tomb of the Sharif Hasan Saidi bin Abdullah, incidentally the only tomb at Gedi with a name that has not been forgotten. There are traces of an inscription made in the wet plaster of the tomb, but they are now too worn to be legible. Below the house, traces of sub-structural occupation were found, similar to the sub-structural occupation below the mosque at Kilepwa.

The original house seems to have consisted of two series of rooms, but this building was soon converted into the characteristic Gedi house with the triple series of rooms. The entrance was at the south end of a long sunken court or "ukumbi" with a platform in front of the facade of the house. From the platform, doors led into the house and an inner court. At the other end of the long front room was a lavatory with a carefully plastered pit, 27 ft. deep, and a bench and seat for washing. Behind were two rooms, the last with internal pilasters at the outside corners and a platform raised about a foot from the ground, on which the sleeping mat would be laid. The inner court, which was used as the "haramlik", or women's salon, had also three rooms behind it.

This large house was subsequently converted into two by the blocking of the doorway between the courts, the opening of a doorway in the outer wall of the inner court, and the construction of another lavatory at the end of the front room. At the same time another residence was built, consisting of rear and side rooms taken from the old house, to which was added a long room with a narrow sunken court-yard in front of it. The single small bedroom of the new house has the sleeping platform and was entered originally by a door with a high sill which was reached by a wooden step. Other examples have been found at Gedi of this type of interior doorway, which was particularly approved for bedrooms. Behind

Views of Gedi and Some Recent Finds

this room was a chamber without a door, entered by a trap door below the ceiling, which was a store. These chambers with access from a bedroom exist in all the houses at Gedi, and it is probable that their primary purpose was to keep the bags of cowries which were the currency.

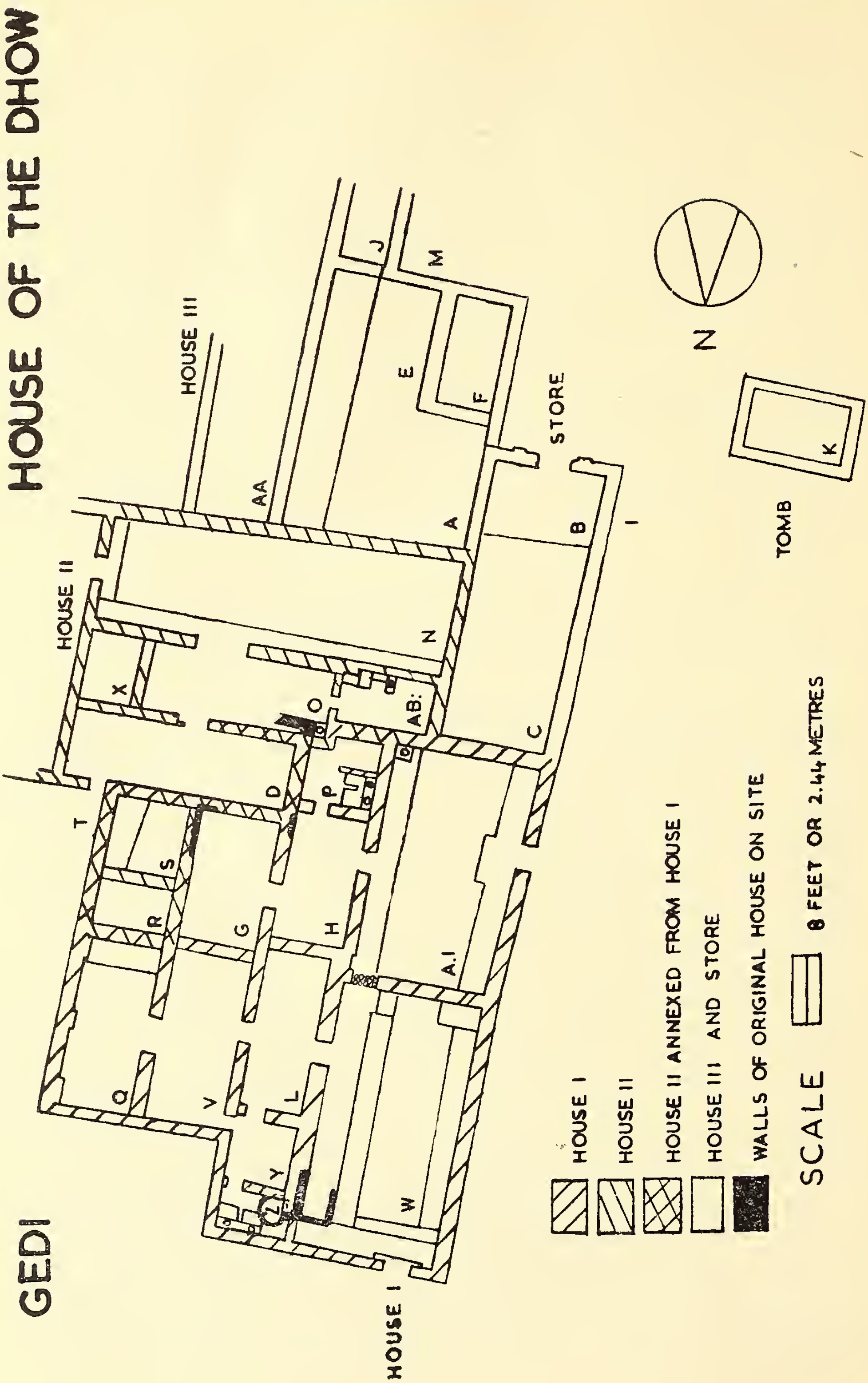
The new house was sandwiched between the large house described above and another house which has not been excavated. At the side of the new house is an open court or enclosure used as a store, or, less likely, as a lock-up for slaves at night. It is entered beneath a tall arch and on the inside is a platform about six inches above the main level of the court.

In the wet plaster of the walls of Rooms H and D rough pictures were incised. The sketches in Room H portraying kites and a bird, possibly an ostrich, are the artless scrawlings of children, of more interest to psychologists than archaeologists! But the third, on the wall of Room D, is a conscious work of art and is a recording of an actual event — the launching a dhow, perhaps the "bon aventure" that paid for the house. The picture has unfortunately deteriorated and the drawing has been made with the help of a photograph taken some years ago by Mr. Colin Campbell of Kericho.

The roofs of the middle series of rooms and the lavatories Z and AB were of coral tiles; the other rooms seem to have had red earth and rubble roofs. This is contrary to the normal practice, which is to pay more attention to the outer than the inner rooms of the house.

The most interesting find archaeologically was the rim of a large bowl with both ribbed and incised decoration. This sherd came from a cutting outside the east wall of the inner court A.1, and belonged to the substructural level. It is the only sherd so far found at Gedi in which the ceramic features of the inhabitants of the Gedi area before the coming of the Arabs are combined with those of the new arrivals. In this level were also found sherds of a number of large-shouldred bowls and bowls with in-curved rims and a dark crimson paint on the inside, which were common at Kilepwa, but which have been scarce at Gedi.

Some of the finds are shown on Plate 8. At the top is an iron point, perhaps a fish-spear. Below this is a plasterer's trowel, which was found at the bottom of the lavatory shaft, and two copper bracelets. The trowel was made at latest in the 16th century; but would have caused little comment if seen in a mason's hand to-day! The two sherds of porcelain are: left, a sherd of a celadon dish with fish embossed on base; and right, a section from rim to base of a small blue and white bowl with a broad band of formal decoration below the rim. The pattern is outlined in dark blue, and it can be dated to the middle of the sixteenth century. The two ivory pommels between the sherds were found on the floor of Room H. The ivory necklace includes more than 150 beads, and came from the bottom of the lavatory shaft in Room Z. It must have been deliberately thrown in, perhaps to get somebody into trouble. There is no reason to suppose that "fitina" was any less common in the 16th century than it is today.

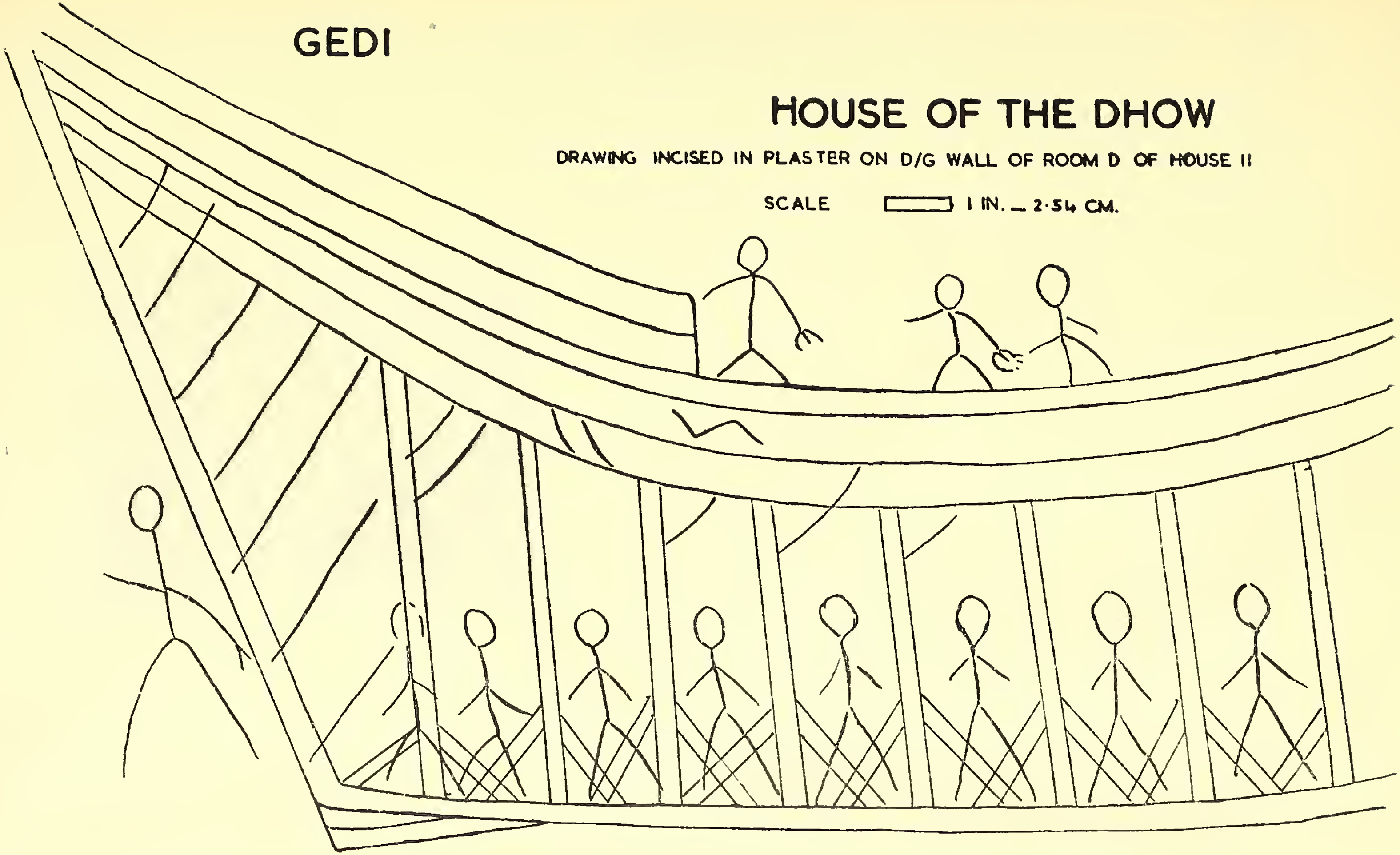

GEDI
HOUSE OF THE DHOW
HOUSE I
HOUSE II
HOUSE III
STORE
TOMB
N
HOUSE I
HOUSE II
HOUSE II ANNEXED FROM HOUSE I
HOUSE III AND STORE
WALLS OF ORIGINAL HOUSE ON SITE
SCALE
8 FEET OR 2.44 METRES

GEDI

HOUSE OF THE DHOW

DRAWING INCISED IN PLASTER ON D/G WALL OF ROOM D OF HOUSE II

SCALE ▭ 1 IN. — 2·54 CM.



OBITUARY

MOLONY — On 22nd August 1952 the death occurred of the Hon. Mrs. Evelyn Molony who, as Miss Napier, was the first Botanist employed by the Coryndon Museum, where she worked from 1930 to 1934.

Miss Napier had always been interested in botany, and after her arrival in Kenya in 1922 she used to draw and paint wild flowers for her own amusement. In 1929 Mr. Ernest Carr, a keen supporter of the Coryndon Museum, saw the flower paintings and felt that they deserved a wider public; he gave a grant to the Museum for the purpose of paying a salary to Miss Napier as Botanist for the period of four years. Having had no previous training in botany, Miss Napier accepted the appointment with some hesitation. She went home, and after some months in Kew, where she received a botanical grounding, she returned to start her post at the Museum in 1931.

Although Miss Napier was always very modest about her accomplishments, one cannot but feel the greatest admiration for the magnificent work she did in four short years. Not only did she build up a very useful Herbarium of East African plants, numbering over four thousand mounted sheets, but she also published a series of papers, illustrated with her own line-drawings, on the East African Flora for the Journal of the "East Africa and Uganda Natural History Society". She adorned the Botanical Exhibit Room at the Museum with a great many of her excellent water-colour drawings of indigenous plants, and made four of the six beautiful colour plates for the first edition of "Gardening in East Africa", 1934.

The Hon. Mrs. Evelyn Molony.

Miss Napier's name appears as one of the collaborators in White and Sloane's standard work on the Stapeliads published in 1937, for which she supplied all the local information available on the subject, as well as a number of illustrations. The authors named *Stapelia molonyae* after her.

At the Kew Herbarium, with which she continued to collaborate and where she sent her collections to be studied and named, Miss Napier's work was much appreciated; her plant material was always well preserved, fully annotated and often amplified with sectional drawings.

Miss Napier went to England on leave at the end of her contract with the Museum. She returned to Kenya in 1935 to marry Mr. D. W. Molony, who was farming there, and whom she had known since 1926.

Marriage, with children to bring up and life on a farm, left little leisure for botanical studies; but Mrs. Molony continued to show great interest in the Museum, and when ever she found an opportunity she brought plants for the Herbarium.

When, four years after she had left the Museum, the writer took over the duties of Botanist, Mrs. Molony was most helpful with her advice, and greatly facilitated his task. She kept in close touch with the Herbarium until the outbreak of the war, when her husband joined the Army and the heavy burden of running the farm and educating her children fell upon her. Indeed, in addition to her own, Mrs. Molony supervised the work on other farms whose owners had joined up; and it was only natural that her visits and contributons to the Herbarium ceased altogether.

However, her interest in the Museum remained to the last. As Miss Evelyn Napier her name will always be remembered in connection with its early development, not only for her work, but also her loyal and charming personality.

P.R.O. Bally.

Sept. 1952.

BOOK REVIEWS

"BIRDS OF EASTERN & NORTH-EASTERN AFRICA": Vol. I pp xxv, 798 (with Index 836): by C. W. Mackworth-Praed and C. H. B. Grant. Longmans, Green & Co., 1952. Sh. 45/—.

Bird lovers in Kenya and elsewhere have been waiting a long time for this book; and it is to be hoped that the second and final volume will not be long behind the first in appearing. The work as a whole which, it seems, is meant by the publishers to form part of an aggregate of bird books to be entitled "The African Handbook of Birds", covers the area comprised by the Sudan and Eritrea in the north, right down to parts, not very clearly defined, of Nyasaland and Portugese territory in the south. The present volume deals with all the non-passerine birds, and two families (Pittas and Broadbills) of the passerines.

Nobody who is interested in birds and can afford a rather expensive book will fail to secure a copy of Praed and Grant's work, for which reason a lengthy description of it here would serve no purpose: a general idea must suffice, with some suggestions for improvement in the later editions which must surely come. Perhaps they will take the form of re-writing.

The systematic plan, and the nomenclature must always be the chief worry of the writers of a new book on birds. It is a step forward, and not backward as might appear, that in this book the species, and not the geographical race, is made the unit and given a serial number. There are 653 numbers in this first volume; so it looks as if when the passerines are added in the second volume the total will run well up to 1500. The suggestion is made that this might be considerably cut down by a relegation to sub-specific rank of some of the forms which the authors class as full species; and at the same time by the omission of the sub-headings (relating to characters, distribution, habits, food, etc.) when races are being treated. Once per species would be sufficient, and then all that would be necessary would be an idication of racial character-difference, and the range, in the case of forms other than the nominate, or the most important. To take one example from the present volume, nobody with an acquaintance of the species in the field could doubt that the difference between *Caprimulgus feridus* and *C. pectoralis* is racial only; yet, following many writers in the past the authors separate them specifically; and habit differences between conspecific races can but seldom be said to exist.

The marginal distribution maps are a great help; and in some families, such as the Storks, the marginal black and white drawings are adequate for identification (except in the case of the Black Stork and Abdim's where the smaller bird is depicted as being the larger of the two). The 53 coloured plates do not comprise all species; but they show the majority, and are well executed and free from the unfortunate over-crowding seen in Robert's book.

There are a good many changes in nomenclature from that of Jackson's book. This is to be deplored; but it will go on from year to year until there is some Anglo-American body brought into existence whose fiat would settle a name for say, at least ten years, when the same body could

issue revisions, equally authoritative. Meanwhile we must just go on acquainting ourselves with the new names put forward, remembering that they in turn may be superseded, and perhaps the old ones restored, as so often in the past.

For Kenya the new work will not replace Jackson, not only because the areas covered are not the same, but because the inevitable compression involved in getting so much detail into a manageable compass leaves no room for anything resembling the lasting charm of Bawana F.J.J.'s field descriptions — never too long for the nature lover. But you must have Praed and Grant as well as Jackson, and then all desiderata that the present state of knowledge can supply will be met.

The oologist, as always, will remain unsatisfied. He wants more detail than any book nowadays can reasonably give without getting lop-sided. But at least really famous doubtful records — everyone of the older brigade knows which they are — might have been either omitted or supplemented with references which would have enabled proper evaluation by the younger generation.

In a future edition it is thought that more stress might well be laid on points of difference between species that are puzzlingly alike on first acquaintance. What is very superficial to the ornithologist may be baffling to the beginner.

Lastly, the authors' statement in the Preface that the book is not meant for the library shelf, but for use and reference in the field, can surely be no more than the expression of a pious hope, unlikely of fulfilment. The first volume weighs 3½ pounds; and anyone who has taken Jackson (about 4 pounds to the volume) with him once into the field has probably never done so again. All right for the car perhaps; but in Kenya at all events, where the roads are the worst in Africa, damage will be done even on a car trip. If you think of subjecting this costly book to the dust, heat and sweat that are the normal adjuncts of African bird-watching, get a nice leather satchel made for it with sheepskin lining, or, better still, buy two copies and keep one rigorously at home. But try your hand first at identifying a small Hawk in flight by means of the key which begins at page 116. The present reviewer can only afford one copy and will keep it handy — but on a shelf.

The pocket volume of African birds has yet to be written.

C. F. B.

"UNDER THE SEA WIND", by Rachel L. Carson
Staples Press Ltd., London.

This book is by the author of "The Sea Around Us," a best seller in America to which much publicity was given. Many such books have lately been produced in America, of which the best so far is "The Bay".

The present book describes the migration adventures of two sanderlings, the mackerel and that old stand-by, the eel. Interposed with these are mullet, sea trout, shrimps and many other things, all described in high-power language. If you know nothing about these things, it is worth reading. The illustrations in the English edition are by C. F. Tunnicliffe.

H. C.

"THE SHOALS OF CAPRICORN", by F. D. Ommanney.

Longman, Green & Co., London.

Dr. Ommanney was a scientific Fishery Officer on the Seychelles-Mauritius Fishery survey which was conducted in a 45 ton drifter, the "Cumulus". Anyone expecting to find out all about this survey and its results will be disappointed; but as an account of the author's impressions of Mauritius, Seychelles, Aldabra, and many of the small islands, the book is first class, and written in English up to Ommanney's best standard. To the average person, even in Kenya, these islands are vague names and a holiday trip to the Seychelles would represent the total knowledge of the majority. The book is written with wit and humour, and has good photographs. I advise everyone to buy it.

H. C.

"THE GAME FISHES OF AFRICA", by Hugh Copley, O.B.E., H. F. & G. Witherby Ltd., London.

In the author's note he states that his object in writing the book is "to help and guide men situated in any part of Africa in their efforts to catch fish"; and one cannot read many pages before realising that he has achieved his purpose. It is a book for reference, to keep ready to hand, and not just to pick up one evening after dinner.

After an introduction in which fish, their organs, senses and functions are shortly discussed in non-technical language, the book goes on to its first Section, the Sea Fishes. Each fish which the angler will catch, or see in the fish markets, is described by its common name, its scientific name, and its native local name. Distribution, localities and description are given; and finally, under Remarks, are discussed sporting value, baits, edible qualities, weight attained, and other information of interest to the angler.

After sea fishes comes a section on Freshwater fishes, followed by a section on baits. The indexing is very thorough, having two parts, one of the common and native names, and the other the scientific names.

The book is illustrated by 24 plates of photographs, and 176 line drawings. The paper and printing is of a high standard and the book a comfortable size to handle. It treats of the whole of Africa, and is unique in that respect. The author says "the book is purely a beginning, much has been missed, mistakes may occur, and sporting fish may have been omitted", but it is a grand beginning, and will be a standard for many years to come.

D. F. S.

"A COLOURED ATLAS OF SOME VERTEBRATES FROM CEYLON".

Vol. I. Fishes. by P.E.P. Deraniyahala. Ceylon Nat. Museums.

This is volume I of a series of publications on the Vertebrates of

Ceylon, written by the Director, Dr. Deraniyagala, and with his own illustrations, consisting of 34 coloured plates and 60 text figures.

Naturally the book does not deal with anything like all the fishes of Ceylon; but it does deal with all the fresh water ones and a few of the marine families. It can be warmly recommended to any person interested in fishes and especially in those of Ceylon; and it forms a welcome addition to the Society's Library.

H.C.

Letter to the Editor:

RESEARCH ON AFRICAN BATS.

Sir,

I am engaged in working on the status of various African bats and should be grateful if I could appeal to readers of your Journal to help me in acquiring specimens. Specimens of any species from any part of Africa would be most welcome and helpful to me in my research.

Bats are best preserved by being put as fresh as possible into a solution of 10% formalin or industrial spirits. Before immersion it is important that a small slit be made in the belly to allow rapid fixation of the viscera by the preserving fluid. A pencil written label giving date and locality should be attached. When the specimens have been in preserving fluid for two or three weeks, take them out and pack in damp paper or cotton-wool in a tin, to prevent drying-out, and send airmail parcel post (6/- per half pound), labelled Natural History Specimens of No Commercial Value to

Dr. David L. Harrison, Bowerwood House,
St. Botolph's Road, Sevenoaks, Kent, England.

I shall be pleased to refund postage expenses.

Yours etc.,

25 Feb. '53. Sgd. David L. Harrison.

Editor's Note.—It is hoped that as many readers as possible will assist Dr. Harrison in his bat researches. Among his forthcoming publications is an important one dealing with the bats of Kenya Colony, giving characters by which our local species may be identified, which will be published in this Journal. If it would assist any member of the Society who secures bat specimens, the Editor is prepared to pack and forward these to Dr. Harrison.

NOTICE TO READERS.

The Editor has received the following notice from Colonel B. E. Horton :—

"House to let, Shimoni, Kenya coast; fully furnished stone lodge, 3 bedrooms, bathroom, inside sanitation, ample water, house-servant. Secluded, peaceful and trouble-free. Good anchorage. Cheap fish, eggs and poultry available.

Charter 18 ft. auxiliary sea-going day boat arranged. Apply B. E. Horton, Shimoni, via P.O. Mombasa."

The Editor has pleasure in bringing this notice to the attention of members on his own personal recommendation. Shimoni is one of the most interesting localities on the coast for a naturalist, especially those keen on birds (many sea birds breed on an islet just off Shimoni), marine fauna and butterflies.

PRINTED IN KENYA BY W. BOYD & CO. (PRINTERS) LTD,

.96.57

Journal of the East Africa Natural History Society

OCTOBER, 1953. VOL. XXII. No. 2 (94)

SMITHSONIAN
APR 23 1954
LIBRARY

EAST AFRICA NATURAL HISTORY SOCIETY.

PATRONS.

His Excellency The Hon. Sir Evelyn Baring, K.C.M.G., K.C.V.O.

Sir Philip Mitchell, K.C.M.G.

Sir Henry Moore, K.C.M.G.

PRESIDENT.

Hugh Copley Esq., O.B.E.

VICE-PRESIDENT.

R. W. Rayner Esq., B.A., A.I.C.T.A.

EXECUTIVE COMMITTEE.

P. R. O. Bally Esq.,

Colonel M. H. Cowie, M.L.C.

W. Hale Esq., B.A.

J. S. Karmali Esq., B.PHARM., PH.C., D.B.A.

Miss E. J. Blencowe, S.R.N., S.C.M.

J. McDonald Esq., C.B.E., D.F.C.

Miss M. D. Ball.

P. J. Greenway Esq., O.B.E., F.L.S.

SECRETARY.

Miss D. Ewing.

HON. EDITOR.

J. G. Williams Esq., M.B.O.U.

HON. TREASURER.

W. R. Bowles Esq.

HON. LIBRARIAN.

R. A. F. Brenan Esq., M.A.

All correspondence in connection with this Journal should be addressed to:
The Hon. Secretary, P.O. Box 658, Nairobi.

Journal
of the East Africa Natural History Society

OCTOBER, 1953. VOL. XXII. No. 2 (94)

CONTENTS

THE STUDY OF SNAILS AND SLUGS IN EAST AFRICA

By BERNARD VERDCOURT, B.SC., F.L.S.

Most members of the Society probably see a few snails during their rambles, but have not been able to identify them. Many may not have realised that they are worth collecting. Much material is still needed from East Africa particularly by local Museums. Every member can help by collecting. Material complete with the animal preserved in spirit is particularly needed. Almost any species of snail drowned, and then preserved is of great value for anatomical investigations. Any member thinking of specialising on a particular group could do a considerable amount of new work. The writer is willing to receive material at the East African Herbarium, P.O. Box 5166, Nairobi and attempt identifications. Any material received will be put in the study collection of the Coryndon Museum.

Snails and slugs belong to the Mollusca which is the second largest group in the animal kingdom, following the insects in abundance of individuals and species. It comes a very poor second, however, there being perhaps about 70,000 described molluscs as against a million or more insects. The phylum Mollusca contains a wide variety of animals which would perhaps not be associated with each other by a layman. Octopi, mussels, chitons, slugs, sea and land shells all belong to the same phylum. It is not a very easy group to define; most of the members of it have a shell which is laid down by tissues known as the mantle; those having a head develop a highly characteristic rasping organ termed a radula (about which more will be said in another article); most species have a muscular foot used for locomotion; and all have a rather complicated nervous and reproductive system. In this paper we are concerned with only two out of the five main groups contained in the phylum—the Univalves (Gastropoda) and the bivalves (Lamellibranchiata). Snails and slugs are of course closely related to marine shells but students and collectors usually concentrate on one group or the other.

Non-marine mollusca have always been favourites with amateur naturalists and although the group impinges but little on the layman, there is a very large amount of literature devoted to the subject. There are two national journals in England alone and 15 others published throughout the world which are well-known. There are innumerable obscure ones. Despite this general activity the East African fauna is not well-known. If one finds a snail in Europe, North America or South Africa there are lavishly illustrated monographs which render naming it easy. If, however, one tries to name a snail in Kenya one is faced with a very difficult task. There is no faunistic work which has in it a compilation of the scores of scientific papers which have been written on East African land and freshwater mollusca. This literature is very scattered in German, Italian, French and English language journals. Unless one has a very good knowledge of the genera of tropical African mollusca, and an extensive library the naming of individual specimens is difficult in the extreme.

There is no professional specialist in the group in East Africa, neither is there a good collection from which one could at least name by comparison. The existing collection at the Coryndon Museum is a good nucleus and when organized and expanded will be invaluable to anyone wishing to study East African Mollusca.

Mention should be made of the annually published Zoological Record, a publication the more recent volumes of which are available at the library of the Coryndon Museum. Abstracts of nearly all papers published on Mollusca are included in the appropriate section of this publication and readers can see what work has been done.

There are other difficulties. The study of East African mollusca is strangled by the indifferent work of some of the previous students. These people described large numbers of species from poor "dead" (i.e. devoid of animal) shells without reference to anyone else's work at all. The whole stage is therefore cluttered with synonymy. One sends the same species to three people at different museums and as often as not one gets three different names back. This state of affairs always happens until a group is revised and synonymies sorted out. In many groups such revisions were carried out long ago (birds, mammals, butterflies etc). Without a knowledge of the anatomy of a snail it is often quite impossible to put it in its correct genus. The dissection of a minute snail is a very skilled job. These early workers paid no attention to this side and the correct genus of several hundred species will be unknown until material is reobtained from the type localities and dissected. It will be as well to give a very rough idea of the work which has been done and what books are available. All the early explorers and many missionaries (French in particular) picked up a few shells e.g. Speke and Grant, Burton, Schweinfurth, Last, Grandidier, Emin Pasha, et al. and these were described chiefly by J. Bourguignat, a Parisian naturalist well-known for his incredible splitting and enormous output, who has left chaos everywhere, Crosse and Ancey, both French, Edgar Smith of the British Museum, the greatest expert of his day, and many others. Their papers are to be found in Journal of Conchology, Proc. Malacological Soc., J. de Conchyliologie, and private publications. The exceedingly odd fauna of Lake Tanganyika which has led to raging arguments concerning the history of the lake has a voluminous literature of its own which increases yearly. The earlier literature is admirably summarised by Cunnington (1920). The first compilatory work is that by the great expert Edouard von Martens (1898) but it deals mostly with Tanganyika. Although it is exceedingly rare and the nomenclature outdated it is very useful since nothing else has appeared. The monumental works on the mollusca of the Belgian Congo by Pilsbry and Bequaert (1919 & 1927) are of great value particularly where the Mollusca of Uganda are concerned. Connolly's works on the mollusca of Portuguese East Africa (1925) and South Africa (1939) are also helpful. During this present century numerous papers have been published by Preston, D'Ailly, Dautzenberg, Connolly, etc. and these may be found in Proc. Zoo. Soc., Rev. Zool. Afr., Ann. Mag. Nat. Hist., and elsewhere. Preston's work was based

entirely on shells and he described things in the wrong genera and even families. He was a dealer and his work is indescribable. A very useful summary of his new species is given by Schouteden (1936) and indication is made as to which of his types are at the Congo Museum (a very large percentage are). Lists of Smith's and Connolly's papers may be found in the mollusca library of the British Museum.

Following is a list of the families represented in East Africa together with the main genera which they contain. Typical representatives of the families are shown on Plate 1. In a future paper a key to the families will be given and mention made of the most important species.

GASTROPODA (Shells in one piece—usually twisted)
Order PULMONATA (air-breathers)
Fam. Streptaxidae: a predominating group in E.A., often minute, carnivorous. Chief genera:— *Gulella, Ptychotrema, Edentulina, Gonaxis, Marconia, Tayloria, Steptostele* and *Varicostele*. (Fig. 1.)
Fam. Helicarionidae: thin-shelled species with animal barely able to retract into its shell. *Helicarion, Sheldonia, Thapsia, Zingis* etc. (Fig. 2).

EXPLANATION OF THE FIGURES.

1. *Gulella fortidentata* (Sm.) Kondoa-Irangi, T.T., Streptaxidae.
2. *Helicarion* sp., Helicarionidae.
3. *Ledoulxia* sp. Ledoulxiidae.
4. an Urocyclid slug, Urocyclidae.
5. *Achatina fulica* Bowdich, Kenya coast, Achatinidae.
6. a European species of *Delima* to show the shape of the Clausiliidae.
7. *Cerastus nobilior* Preston, Muguga, Kenya, Enidae.
8. *Caecilioides* sp., Ferusaciidae.
9. underside of a Veronicellid slug.
10. *Lymnaea caillaudi* (Bgt.), Moshi, T.T. Lymnaeidae.
11. *Burnupia* sp., Ancylidae.
12. *Pila adusta* (Rve.), Zanzibar, Pilidae.
13. *Biomphalaria sudanica* (Mts.), Rungwe, T.T., Planorbidae.
14. *Caelatura* sp., Unionidae.
15. *Melanoides tuberculata* (Mull.), L. Kivu, Thiaridae.
16. *Viviparus* sp., Viviparidae.
17. *Bithynia humerosa* Mts., L. Kivu, Hydrobiidae.
18. *Tropidophora* sp., Pomatiidae.

N.B.—Many of the figures are generalised and are merely to give an idea of the shapes encountered in the various families.

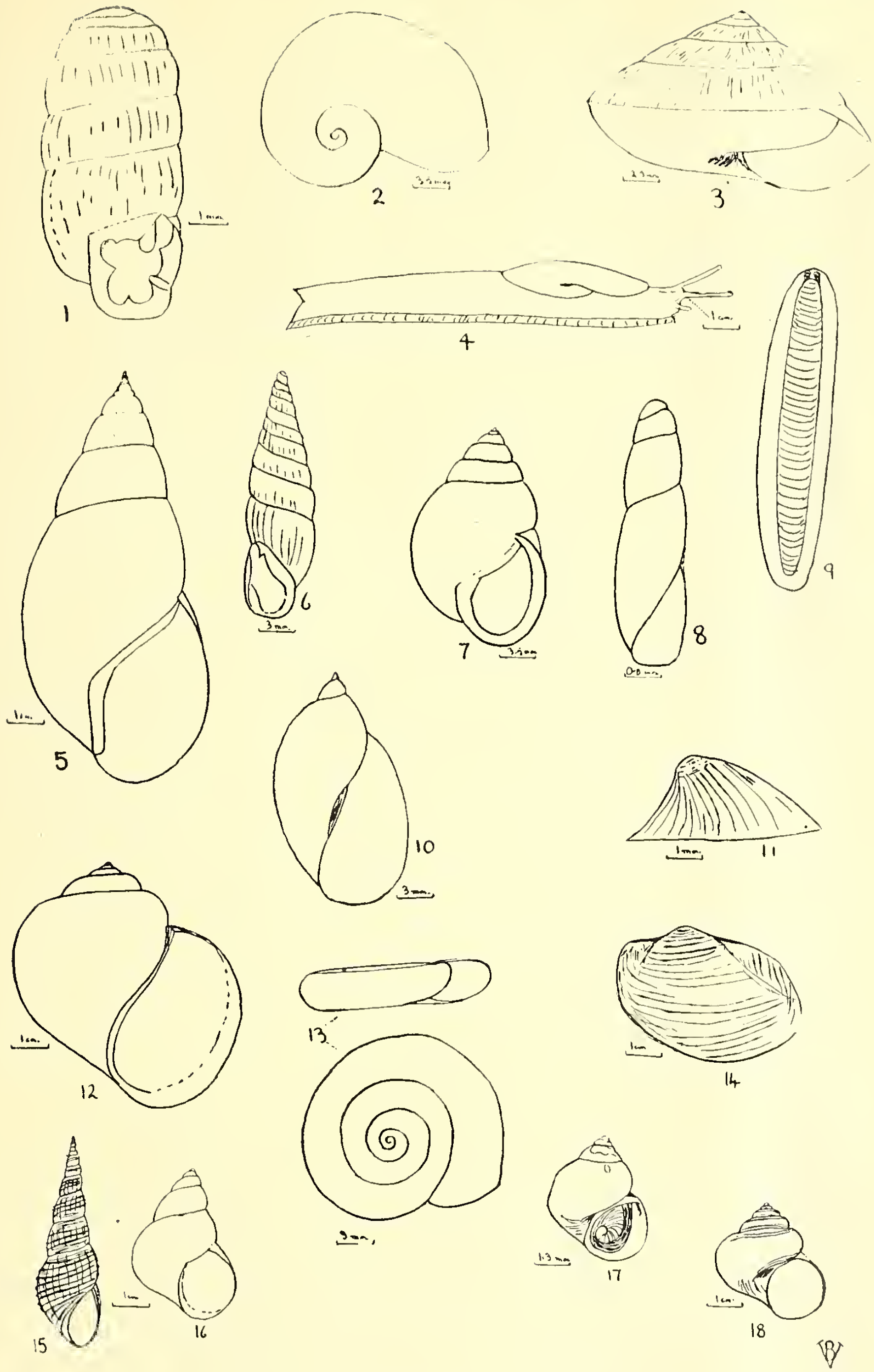


Plate 1.

Fam. Ledoulxiidae: conical thin-walled shells usually very sharply angled on periphery. *Ledoulxia, Trochozonites, Sitala, Kaliella* etc. (Fig. 3.)

Fam. Urocyclidae: slugs, external shell absent. *Trichotoxon, Atoxon,* etc. (Fig. 4.)

Fam. Vitrinidae: like small *Helicarions* superficially. *Vitrina.*

Fam. Endodontidae: usually minute and flattened snails. *Trachycystis, Punctum.*

Fam. Helicidae: true snails such as English 'Garden Snail' usually at high altitudes in E.A. *Halolimnohelix,* and numerous dubious genera proposed by Preston in the Zonitidae !

Fam. Achatinidae: a predominating group, often very large, turreted. *Achatina, Burtoa, Limicolaria, Opeas, Pseudopeas, Curvella, Subulina, Pseudoglessula, Krapfiella, Bocageia, Nothapalus, Zootecus,* etc. (Fig. 5.)

Fam. Clausiliidae: elongate snails abundant in Europe, China, etc. but very rare in Africa; only two species have been described, both in the genus *Clausilia* but certainly not belonging to it. I have found a single specimen of an *Austrobalea* at Moroto, Uganda (Oct. 1952). (Fig. 6).

Fam. Pupillidae: minute cylindrical shells of temperate places. *Truncatellina, Pupilla, Pupoides, Jaminia, Fauxulus* (latter two Preston records).

Fam. *Vertiginidae*: Preston described an "*Alaea*" (=Vertigo) but I know nothing of it.

Fam. Enidae: conical shells. *Cerastus, Conulinus, Rachidina, Rachistia* etc. (Fig. 7).

Fam. Pyramidulidae: predominantly temperate, mostly minute species. Preston has described an *Acanthinula* from Mt. Kenya.

Fam. Ferussaciidae: minute white elongate snails. *Caecilioides.* (Fig. 8).

Fam. Succineidae: usually semiaquatic, but in E.A. often found on rocks and bark. *Succinea.*

Fam. Veronicellidae: peculiar flattened slugs: *Veronicella* etc. (Fig. 9).

Fam. Lymnaeidae: abundant conical aquatic snails with mouth on right hand side. *Lymnaea.* (Fig. 10).

Fam. Planorbidae: flattened disc-like snails, or like *Lymnaea* with mouth on opposite (left) side, abundant in stagnant water. '*Planorbis*', *Biomphalaria, Gyraulus, Segmentina, Bulinus, Physopsis.* etc. (Fig. 13).

Fam. Ancylidae: freshwater limpets, minute shells resembling the familiar marine limpets in shape but not at all related. Several "*Ancylus*" have been described from E.A. but do not belong to that genus. (Fig. 11).

Order PECTINIBRANCHIA (mouth of shell with a close-fitting lid).

Fam. Cyclophoridae: land snails with very rounded whorls. *Maizania.*

Fam. Pomatiidae: similar to last but with strong spiral grooves. *Tropidophora.* (Fig. 18).

Fam. Pilidae: large globular aquatics often in swamps, *Pila, Lanistes.* (Fig. 12).

Fam. Viviparidae: similar to last but more conical. *Viviparus, Neothauma.* (Fig. 16).

Fam. Thiaridae: mostly elongated water snails: *Cleopatra, Melanoides,* and 16 genera entirely endemic to Lake Tanganyika which are peculiarly marine in their appearance. (Fig 15).

Fam. Syrnolopsidae: small shells peculiar to Lake Tanganyika. *Syrnolopsis, Anceya.*

Fam. Hydrobiidae: Minute aquatics. *Bithynia* (=*Bulimus*). (Fig. 17).

Fam. Assimineidae: small aquatic snails usually estuarine. Preston has described an inland genus which is dubious. *Eussoia, Assimineia.*

Order ASPIDOBRANCHIA.

Fam. Hydrocenidae: small littoral shells, mostly South African, one from Kenya. *Hydrocena.*

Fam. Neritidae: familiar nerites of the sea. *Neritina* occurs in estuaries.

Little has been said about the Bivalves but the following families and genera occur in East Africa: Unionidae (*Unio, Caelatura, Parreysia, Grandidiera,* etc.). Mutelidae (*Aspatharia Mutela, Iridina, Pseudospatha,* etc.). Cyrenidae (*Corbicula*), Etheriidae (*Etheria*). Sphaeriidae (*Pseudocorbicula, Sphaerium, Pisidium.*) (Fig. 14).

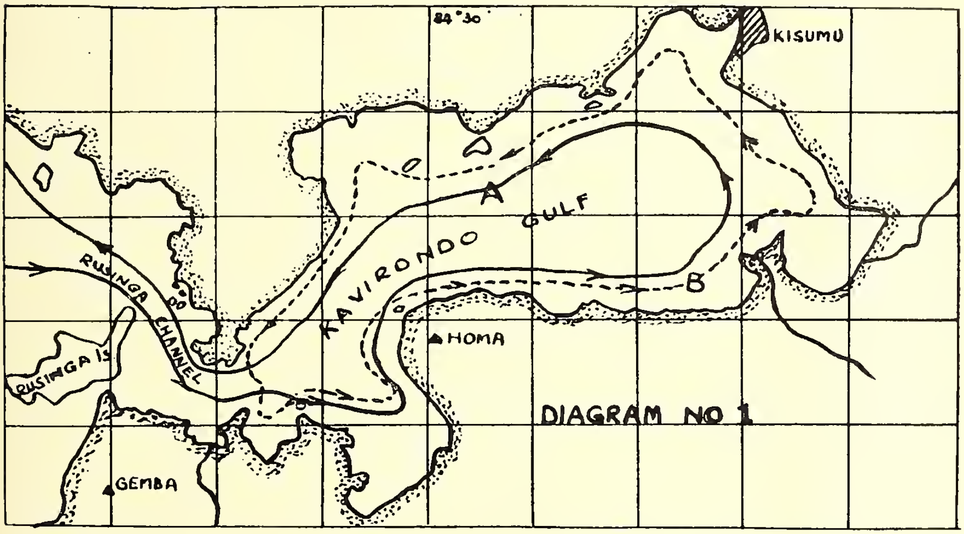
REFERENCES.

Connolly, M.	'The Non-Marine Mollusca of Portuguese East Africa' Trans. Roy. Soc. S. Afr. *12*, 105 ff. ...	1925
Connolly M.	'A Monographic Survey of the South African Non-Marine Mollusca' Annals S. Afr. Mus., *33*, 1 ff.	1939
Cunnington, W. A.	'The Fauna of the African Lakes. . .' Proc. Zoo. Soc., 507 ff. ...	1920
Martens, E. v.	Beschalte Weichthiere Ost-Africas, Band IV of Deutsch-Ost-Africa. Berlin. ...	1898
Pilsbry, H. A.	'A Review of the Land Mollusks of the Belgian Congo. . .' Bull. Amer. Mus. Nat. Hist., *40*, 1 ff ...	1919
Pilsbry, H. A., and Bequaert, J.	'The Aquatic Mollusks of the Belgian Congo. . .' Bull. Amer. Mus. Nat. Hist., *53*, 69 ff. ...	1927

THE TILAPIA FISHERIES OF THE KAVIRONDO GULF.

By Hugh Copley.

The Kavirondo Gulf is an arm of Lake Victoria and is the main producer of lake fish ngege or Tilapia, to Nairobi, which provides us with an excellent fish food. The Kavirondo Gulf is completely within Kenya Colony and the administration of its fisheries together with the other parts of the lake come under the Lake Victoria Fishery Board whose headquarters are based at Kisumu. Before paying particular attention to the gulf let us consider Lake Victoria as a whole. The area of the lake is generally given as 26,000 square miles, nearly the size of Scotland. From north to south it is 250 miles with a greatest breadth of 200 miles and the shore-line is about 3,000 statute miles. The shape of the lake can be compared with that of a soup plate. There is an edge or shelf sloping from the shore gently to the 100 foot mark and then dropping to form the rounded bowl of the soup plate with a maximum depth of 270 feet. The shelf from the shore to the 100 foot line forms the fishing grounds and here all fishing is done.



The Kavirondo Gulf is a depression covered by lake water about 42 miles long by an average width of 12 miles which narrows to 4 miles at the gateway at Rusinga Island. It is very shallow with a maximum depth of 20 feet. The water of this gulf is not stationary by any means for there is a diurnal range as much as 18″ caused by wind pushing water in the main lake through the entrance and into the Gulf. When the wind changes and pushes water in another direction this extra 18″ of gulf water flows back into the lake. This rise and fall in the water level of the gulf goes on all the year round depending on the direction and force of the wind.

There are two species of Tilapia in the gulf; the ngege (*Tilapia esculenta*) and the mbiru (*Tilapia variabilis*). It is the ngege which provides the fish

export from the lakes as it travels and keeps well. The mbiru is not a good traveller or keeper and is consumed locally. Again the gulf is predominantly a ngege fishery whilst other parts of the lake are just the opposite. The general idea that the ngege is found all over the lake is completely without any foundation—in fact the ngege shoals are local.

The ngege is caught by means of a 5″ gill net and this regulation is strictly enforced. Other sized nets are used all over the lake for other fish but this does not interest us. The theory is that by the use of a gill net with a mesh of 5″ no Tilapia will be caught which has not spawned. The nets are 100 yards long when bought, but when mounted are 60 yards long by about 5 feet deep. From 3 to 12 of these nets are joined together and fished as a "fleet". They are set in the evening at dusk and lifted at dawn. Just to show the size of the fishery, there are 500,000 5″ nets; 250,000 2″ nets and 100,000 seine nets in use on Lake Victoria for one year—a value of two million pounds.

To work this fishery there are an estimated 30,000 fishermen, as many as in the whole of the British Isles.

In the Kavirondo Gulf 8,000 5″ gill nets are set every night worth £17,000 and their total length is 272 miles. Each flax net lasts 8 weeks if undamaged or wrecked by hippo or crocodiles. Again 2,200 tons of ngege only are exported from Kisumu a year.

Now what of the Tilapia? The first question for everybody concerned, including the housewife, is "Can this go on for ever?" and secondly "Are we catching too many tilapia and exhausting the stock so that in years to come there will be no fish or very few fish to catch?" This depends on another question "Is the stock of fish in the gulf a closed stock say of 13½ million fish or is the number of fishes caught made up by migrations of fish from the main stock in the lake?" It wil be seen that this is a most important question, for if we have 13½ millions (these figures are purely a guess) of Tilapia in the gulf and catch 4¼ million of mature fish every year can the 9 millions left keep the fishing going? On the other hand if 4½ million fish come in from the main lake every year and keep the stock of 13½ million up to strength and we do not catch more than 4½ million every year the fishery goes on for ever. Into this simplified picture comes a disturbing element. The population of Kenya, all races, is increasing at no mean rate and has a greatly increasing spending power; all can afford to eat more fish, and therefore there are more mouths clamouring to be filled. Whereas 4½ million fish per year may satisfy these mouths this year, as the years pass they will want 6 million fish then 8 million fish and so on. Consequently the pressure for more fish from the gulf will increase, so back we come to our two questions. If the fish population is a closed one, spending its life cycle in the Kavirondo Gulf, a continued increase in the fishing effort will in the long run catch every fish and the fishery is doomed. If however the catch per year is made up from the stock of fish in the main lake the fishery will continue for many more year, but again if the number of fish caught goes on increasing there will come a point when the

fishery is doomed, for there will not be enough increase in the main lake tilapia each year to make up for the number of fish caught by the fishermen in the Kavirondo Gulf and other fishing grounds.

I have endeavoured to show these two different schools of ideas in a simple diagram. The full line A shows shoals entering the gulf, spawning and then returning to the main lake. The dotted line B shows the presumed migration of closed shoals which spend all their life in the Kavirondo Gulf. Now the first thing to do is to follow a fish or a few fishes and find out what it or they do in a year, two years or better still in three years. "Simple my dear Watson" until you look at the Kavirondo Gulf, then go to Rusinga Island and have a look at the lake, and there seems a lot of water. Again think that we are trying to visualise what 13½ million fish are doing in that vast amount of liquid. This can only be done by marking fish and then catching them again to find out their migrations. A good start has been made by Commander Cole and his men of the Lake Victoria Fishery Service who are catching and marking a number of tilapia, which they let go with a fervent prayer that they will be caught again by some native fisherman who will bring them back to them with a correct story of where he caught them and the exact date. It is heartening to know that marks are coming in.

In time we shall know if the tilapia spends its life in the closed gulf or migrates and circulates in the main lake. The marking experiments have started in the gulf but in time will be moved to the entrance. Somebody will say that's all right with marking and getting back the few but they are a tiny proportion of the whole population. They are, but as the tilapia is a shoal fish with very few stragglers we can consider the few caught as representative of the movements of the whole. So far our reckoning has been on a very simple basis but many complications set in which make a fishery officer go bald long before his time.

If we go to other great fisheries we find that certain fish, cod and herring for instance, show natural fluctuations in abundance and these fluctuations are in cycles of 10 and often 25 years. It has been proved with cod and herring and is believed to be true for other fish like menhadden, sardines, tunny etc.

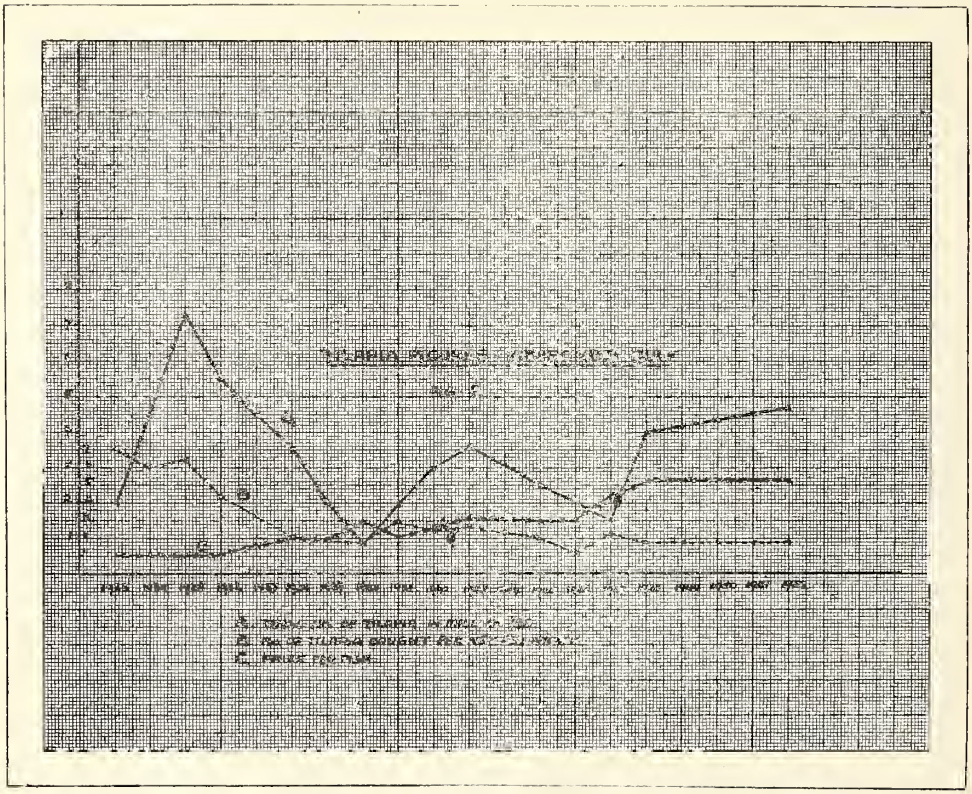
Among the natural causes producing these fluctuations are the influence of favourable or unfavourable hydrological or physical conditions such as temperature, light intensity, currents, storms by surface agitation of the water, variation in food supply, variation in natural enemies, variation in the number of eggs spawned, variation in migrations of young and old fish, variation in population pressure and others.

The most important environmental factor for the survival of the larval fish and hence the future of the brood of the year is the presence of the proper food in proper quantities at the stage of development when the newly hatched larval fish has used up its yolk sac and must feed on phytoplankton or microscopic food. If that food is not there just when all the

millions of tiny tilapia want it, mass death will occur affecting the fishing adversely two or three years hence. It is gradually being realised that this may be the predominant factor in the whole history of the tilapia and we know nothing about it.

The only way we can find out how the fishery is working is to study the catch of fish made from the gulf every year, for the catch should follow the up and downs of the fish shoal. This is the only way we can do it as we cannot know the number in the shoal every year or the number born —I wish we could.

The curve of total catches (Fig. 2) shows two peaks of abundance, one in 1935 and another in 1943, but it also shows that the peak in 1943 was much lower than that in 1935. The curve also shows a cycle of 8 years, up to 1947. After 1947 the fishery gradually stabilises itself to a total catch of



5 million fish and a catch rate of 1.9 fish per net per night. In other words the fishery is in equilibrium; but any increase in the number of fish caught should affect the catch rate per night, and the fishery would progressively decline until it did not pay the fishermen to catch a fish. The gradual decline in the curve (Fig. 2A) from 1937 to 1940 was due to the low price received for fish with an upward increase in the price of nets. Supposing one converted all the nets set in the gulf every night to nets which would catch twice as many fish i.e. 3.8 fish per net per night and still keep the

fishing in equilibrium then half the number of nets only could be allowed to fish each night. The number of fishermen does not matter. This fishing effort, as it is called, also depends on the cost of each net together with working costs, which shall be below the price the fisherman gets for his fish. If the working costs go up and the price received for the catch remains stationary, then the number of fish caught will decrease as the fisherman will look for another job. The fishery benefits as it gets a rest, but the general economy of the Colony suffers.

It seems therefore that the fishery is in equilibrium, but we want more fish to feed the increasing population as the years go by—what shall we do? The ngege is not the only fish in the Kavirondo Gulf or in the lake. Other fish must be exported, like bagrus, butter fish, lungfish which are good wholesome food, and the sooner this is done the better.

I hope I have convinced any reader that firstly the fisheries of Lake Victoria are very large, for a yield of 80,000 tons of fish a year by 30,000 fishermen is no small fishery. Secondly various environmental factors for the spawning stock are of vital importance to the successful continuation of the fishery. Thirdly to hold the present position other species of fish have got to be exploited.

Finally how is the fishery controlled and how much does control cost? The lake fisheries are controlled by the Lake Victoria Fisheries Service under the leadership of Commander G. Cole who has 3 ships and 6 Fishery Officers for a lake the size of Scotland. The total amount of money available for the service in 1953 is £20,128 equally divided between Kenya, Tanganyika and Uganda. In other words the people of Kenya pay £7,000 a year towards a service which regulates the use of 850,000 nets; producing 80,000 tons of fish, keeping 30,000 fishermen at work and providing 800,000 people with fish. Such is dirt cheap at the price.

WHAT FUTURE JOURNALS WILL CONTAIN

The Editor wishes to inform readers that every effort is being made to improve the standard of the Journal and to render it of greater use to members. With this end in view two series of articles will commence shortly, "The Identification of Birds of Prey in Flight" and "The Identification of East African Marine Shells". Mr. B. Verdcourt introduces the latter series with a fully illustrated account of the Cowries. A number of species of these attractive shells are not represented in the Coryndon Museum's collection and an appeal for specimens is made to anyone who may be at the coast. Any contributions from your own Cowrie collection would be most acceptable. Thank you.

John G. Williams,

Hon. Editor.

ON THE NORTHERN UASO NYIRO.

By Merrell Dalton.

The success of the small Lodge, erected by Kenya National Parks on the banks of the northern Uaso Nyiro in 1950, may be seen by the many delightful entries in the Visitor's Book proving that a camp of this description is appreciated, not only by so many of our own local people, but also by those drawn to it from places as far afield as South Africa, England and the United States. Members of the Walt Disney Film Co., for instance, made successful sequences of elephant, giraffe, buffalo, etc., when camping on the river in August last, (1952), and the studio report, as quoted to us by Mr. and Mrs. Al Milotte who were taking the pictures, states "they, (the studio) particularly liked the ones of the birds, remarking on the brilliance of the colour".

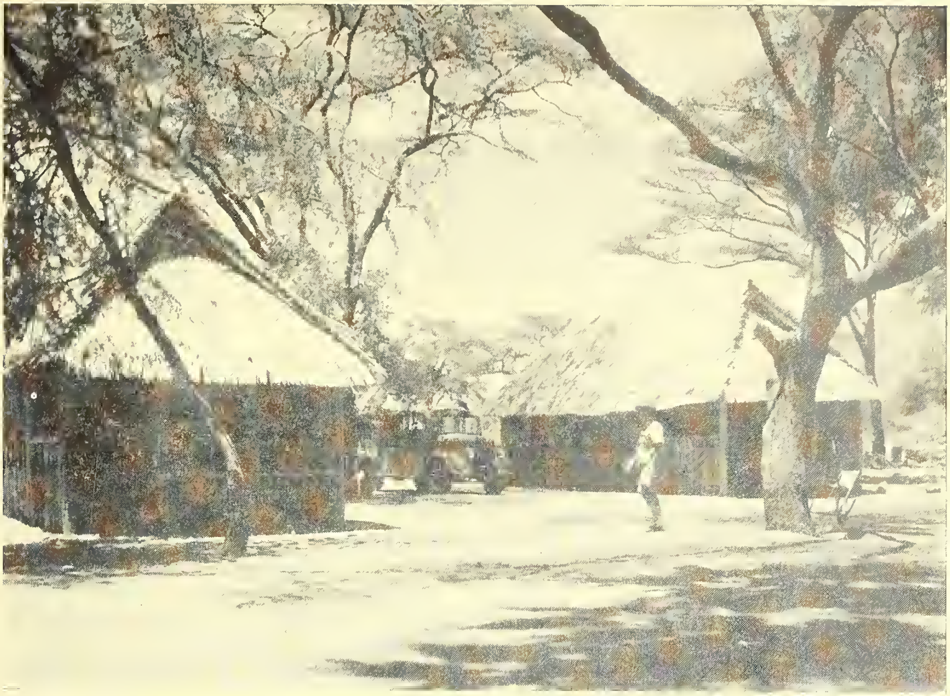
A couple from Natal, both keen ornithologists, remarked on the tameness and variety of the birds, and were thrilled to find the nests of no less than seven different species inside the small lodge perimeter.

This Lodge, which consists of four double cottages built of cedar logs and thatched with *makuti,* is situated some thirty four miles from Isiolo in the Marsabit National Reserve. The bandas are built close to the river, and are almost opposite the spot known to the local Samburu as 'Nyama Yangu' (or Newman's camp), for this was the headquarters of one of the greatest elephant hunters of his day. Huge acacia trees and *Aphania senegalensis* (which rather resembles a mango but is no relation), make dense green-black shade. Along the banks, there are dom palms, and, further upstream, fine specimens of *Piptadenia hildebrandtii* and Tana poplar.

But the belt of vegetation is perilously shallow, great chunks of bank are devoured during the bi-yearly floods, and the debris of dead wood is considerable. Two of the worst factors, however, are the indiscriminate burning of trees by honey hunters, and the ravaging of bark, young trees and shoots by the multitudinous goats owned by the Samburu, and also by the Turkana who reside along the south bank of the river.

The opening of a track through the Reserve that extends from the main Marsabit road up to the old Barsalinga crossing, and beyond to the Maralal escarpment, has been very effective in stopping poaching on the north side. This is also patrolled by National Reserve scouts.

Those interested in game photography should have little difficulty in obtaining pictures of elephant, rhino, buffalo and other game. Elephant families are frequently seen bathing in the river in the hottest time of day. Lions are less easily come across, largely due to the nature of the bush and their wandering habits, but a pride of thirty was reported near Lolokwi—that great flat-topped hill that is such a well known N.F.D. landmark—in the first quarter of '51, and odd lion have often passed close to, or even right through, the environs of the camp. This area is best



A view of part of the National Park Lodge on the Uaso Nyiro.

A group of elephants on the northern Uaso Nyiro.

visited during the driest months for then the game is, of necessity, concentrated on the river which is at lowest level. Hundreds of animals water along this river, and the ground is a network of tracks graduating from the enormous footpads of elephant to rhino, buffalo, zebra, and giraffe, the spoor of countless antelope, the impress of the cat tribe, hyaenas, apes, mongooses, down to the tiny etched tracks of birds. Crocodiles are numerous and lie out sunning themselves on the open sand banks: they take toll of many sheep, goats, and buck, and have been known to pull down a full-grown giraffe which was drinking in the river.

Yet a pair of Egyptian geese, which frequented the shore opposite one of our temporary camps, were utterly indifferent to the crocodiles and wandered about plucking tufts of grass within a foot or two of the drowsing monsters. I once saw a crocodile driven out of its mud pool by two of the geese which pursued it to the water's edge with furious hissing and honking !

Impala abound around the Lodge site and have become increasingly tame, treating a car, quite rightly, as a tiresome intruder ! Grant's gazelle, gerenuk and oryx are more shy, but the waterbuck are quiet enough as are the giraffe and handsome Grevy's zebra.

Baboons move about in troops of fifty or more. Do they patrol their own 'beat' one wonders? It seems probable that families keep very much to certain localities providing the larder remains good. After a day of gleaning in the bush for insects, scorpions, seed, and wild fruits the troop returns home to the river for a drink, later to climb into comfortable and safe forks and niches in the fig and acacia trees for their night's lodging.

It is fascinating to watch a party out foraging. The troop is usually accompanied by a sentinel, some old man baboon who gives utterance to a resounding 'hoch' if danger threatens whilst the rest busy themselves diligently turning over stones and digging for grubs and beetles. The baby baboons when tired, or too small to keep up, are carried on their mother's back or tummies, often sitting erect like miniature jockeys.

Baboons move with a peculiar loping stride and must cover a considerable area of ground as well as combing that ground very thoroughly. It is surprising how these heavy animals can roost in quite light foliage, and when the wild figs and other fruits and berries ripen they seem able to reach the further clusters with the agility of any monkey.

The quantity of riverine birds seems to vary with the seasons. Wood Ibis and Jabiru Stork are more rarely seen but herons, egrets, bittern and geese are fairly common, especially at low water when the catchments made by old logs, boughs, reed islets and driftwood hold an infinite variety of insect life and the green grass of the banks is alive with frogs, grass-hoppers. mice and beetles. And surely, the Goliath heron, standing with bent knee. long powerful beak poised to strike, shadow reflected in the stream, is one of the loveliest sights to be encountered on the river? The tracks of these

great birds, unlike the flurry of plover and scratching of guinea fowl, are grave and ponderous as befits a conscientious fisherman.

Other birds to be recognised in this area are kingfishers, parakeets, orioles, green and gold bee-eaters, gorgeous rollers, sunbirds, plovers and wagtails, flycatchers, drongos, hoopoes, woodpeckers, gay yellow weavers and their sombre and quarrelsome cousins the sparrow weavers, red-winged starlings and louries to name a few of them. The guinea fowls in the vicinity of the Lodge are tame as poultry, and there are enormous flocks of the brilliant vulturine species, more showy from the photographer's point of view than is the gentleman in the helmet. There are plenty of game birds too, francolin, sandgrouse, and lesser bustard. Greater bustard are more usually found in the open country between Barsalinga and Wamba and the Maralal escarpment. Birds of prey include the magnificent Bateleur eagle, the fish eagle, the crested hawk eagle, eagle owls, hawks, harries, vultures and kites.

A small stone bird bath in front of the bandas has done much towards creating an atmosphere of friendliness, and the weavers, pigeons, hornbills and doves, and delightful little Grant's francolin like miniature bantams now hop about on the open ground joined by gregarious starlings. Please spare your crumbs for them !

Most local residents are aware that the N.F.P. is a 'closed' area, and this necessitates taking out an outlying district pass from the District Commissioner, Isiolo, or from the D.C. Maralal, (Samburu) should you come in via Rumuruti. The camp is so popular that it is wisest to book well ahead, and this is done through National Parks head office, post box number 2076, Nairobi. The charge is moderate enough, being only five shillings per head per night, and all that is required of you to bring is your bedding, (beds, nets, and "Dunlopillo" mattresses are provided), personal effects, crockery, food, and tableware, cooking pots and a servant for your own convenience. Your banda contains a large table on the veranda, several chairs, a long bath, a basin, and hot and cold water is laid on to every cottage.

There is a guide resident at the camp whose services can be hired for five shillings a day, and there are two loop roads to explore, one leading to the top of flat crowned Archer's Post hill, (site of the original Post through which all mail, stores, etc., were transported by camel, donkeys, and bullock wagons to the forward stations of the frontier), and the other circles round Koitogor, a rugged massif, where, if you go early enough, you should find rhino, and perhaps buffalo and elephant, as they wend their way back into the scrub after their nocturnal watering at the river.

As petrol can now be obtained at the Lodge it is easy to make various sorties. The road to the camp leads on for some seventy miles upstream and eventually hits off the Wamba Maralal road at the foot of the escarpment. Or you can turn off part way, and, with the help of the guide, cross a wide plain which is a short cut over to Wamba and a very favoured spot for rhino which can be seen wandering about right out in open ground or browsing along the edge of the thicket.

On our first visit to this plain we counted nine rhino !

MUDWORTS IN KENYA

By BERNARD VERDCOURT, B.SC., F.L.S.

The genus *Limosella* L. (Scrophulariaceae) or 'Mudwort' as it is called in Britain is very little known in East Africa although several species occur. This short note is intended to draw attention to these interesting plants since in all probability undiscovered species remain to be found and even the commoner ones are very poorly represented in herbaria. All are small aquatic or semi-aquatic herbs with leaves and flowers radical in basal tufts a few inches in diameter. Three species are mentioned in Flora of Tropical Africa IV (ii) p. 352-3 (1906), but none is recorded from Kenya.

KEY TO THE SPECIES

A Leaves ovate or elliptic, blades floating abruptly narrowed into fine petioles; rest of plant submerged; flowers sessile:

Leaves narrowly elliptic .... 3. *L. africana* Gluck

Leaves oval .... 2. *L. capensis* Thunb.

AA Leaves oblanceolate or elliptic, blade merged gradually into a long coarse petiole; plant growing on muddy banks; flowers stalked .... 1. *L. major* Diels

AAA Leaves linear or subulate .... 4. *L. macrantha* Fries

NOTES ON THE SPECIES

1. *Limosella major* Diels. This has been recorded from Eritrea and South Africa. It was recently discovered by P. J. Greenway and C. F. Hemming at the foot of the escarpment on the Naivasha road in a seasonal swamp together with sedges, Crassula, etc. in open Acacia woodland. The flowers are pale blue and the plant produces runners. The whole plant is rather fleshy. Greenway & Hemming 8768 (E.A. Herb., and Kew).

2. *Limosella capensis* Thunb. This species is known from South and South West Africa. It seems to be frequent in very seasonal ponds and swamps e.g. at Muguga on murram. Verdcourt 641 (E.A. Herb and Kew) and Elmenteita, Soy Sambu Estate Bogdan 1054 (E.A. Herb. and Kew).

3. *Limosella africana* Gluck. This has been confused under *L. aquatica* Linn. the common European species and is recorded from Abyssinia and the Cameroons Mountains. Mr. Bogdan has collected this species at Elmenteita, in plains round the lake, pools in saline pan with rock bed. Bogdan 3034 (E.A. Herb. and Kew).

4. *Limosella macrantha* Fries. This species has not been seen but was described and figured by its author from plants found in the Aberdares at over 10,000 ft. R.E. & Th. Fries 2691 (Uppsala). The figures may be found in Acta Hort. Bergiani 8, 49 (1925).

Further material from other localities in East Africa is must desired. I have not seen Fries's material from Mt. Kenya which he calls *L. aquatica* Linn.

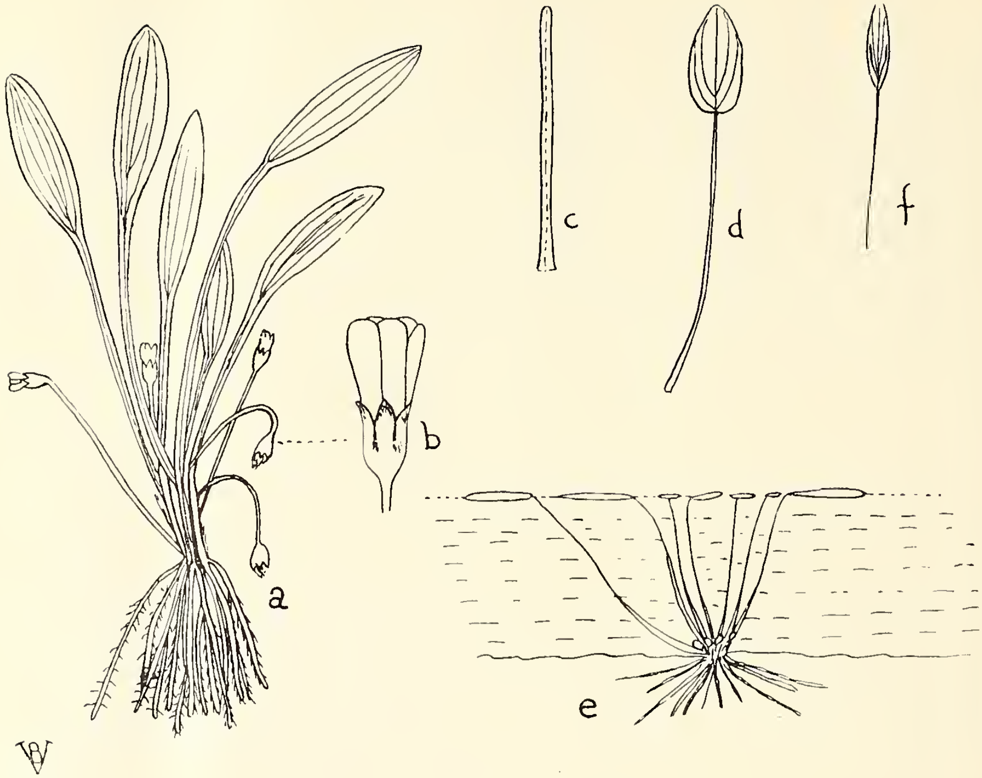


Fig. 1. "Mudworts": —

(a) Entire plant of *L. major* Diels, x ½.

(b) flower of ditto, x 4.

(c) leaf of *L. macrantha* R.E., Fr., x ½.

(d) Leaf of *L. capensis,* x ½.

(e) ditto, showing position in water.

(f) Leaf of *L. africana* Gluck, x ½.

A RARE HAWK

A juvenile plumaged Ovampo Sparrow Hawk (*Accipiter ovampensis* Gurney) has been added recently to the ornithological study collection at the Coryndon Museum. In this plumage the Ovampo Sparrow Hawk is very similar to an adult Rufous Sparrow Hawk (*Accipiter rufiventris* Smith) but differs in having buff margins to the feathers of the upperparts and wing coverts and a paler crown.

The donors of this valuable specimen are Mr. & Mrs. C. F. Cockburn of Nairobi. The hawk was secured by a native with a stone as it was standing over a young chicken it had just killed.

The Editor.

A SMALL OUTBREAK OF *EUPROCTIS RUBRICOSTA* FAWCETT (LEPIDOPTERA, LYMANTRIIDAE) IN THE EASTERN PROVINCE OF TANGANYIKA

By John Phipps, M.SC., D.I.C., M.I. BIOL.

In December, 1952, a heavy infestation of castor oil plants (*Ricinus communis*) by lepidopterous larvae was noted at Mtibwa Estate by Dr. F. Leutenegger, Soil Chemist, Tanganyika Sisal Growers' Association.

Mtibwa Estate is a new estate near the village of Turiani, which lies about 80 miles north of Kilosa on the road to Handeni. It was planted in 1952 with castor oil (seed imported from Italy) and pawpaw (*Carica papaya*). In the surrounding area, a good deal of castor oil is grown by African cultivators.

No steps were taken to control the infestation, and by mid-January, 1953, it was found that the castor oil was completely defoliated and the larvae had begun to attack the pawpaw. The advice of the author was sought, and a visit made to the estate on 22nd January, 1953.

By this time about 70 acres of castor oil had been cut down, and the larvae were distributed over the grass. A large number had crossed the narrow track separating the castor oil from the pawpaw, and some of the latter trees were already fairly heavily attacked. The larvae were found particularly on the leaf bases, where the lower leaves had been cut away, and on the fruits, which had been cut for the collection of the juice. A number of fruits were almost completely consumed and some trees must have contained hundreds of larvae. Penetration into the pawpaw area had not proceeded beyond the tenth row. There was almost no attack on the leaves.

Elsewhere on the estate, 30 acres of castor oil remained standing and these bushes, though almost completely defoliated, were heavily infested. Here too, movement of larvae to nearby pawpaw trees had occurred.

A minor but very unpleasant feature of the infestation was the irritation produced by the urticating hairs of the larvae. A large number of larvae were to be found on both the inside and outside walls of the temporary European house on the estate, where they were seeking shelter in order to pupate. Numbers of pupae were also found in the cracks and crevices of the house.

Control Measures. Some very makeshift tests were carried out in the laboratory before visiting the estate. 5% DDT in kerosene was found to kill only after more than 24 hours exposure. "Gammexane" P 520 (6.5% gamma) in water killed after 12 hours, but as this had been tried in the house in an unsuccessful attempt to get rid of the larvae, it was thought unwise to depend too much on it. "Dieldrin" wettable powder also required more than 12 hours to kill. "Gammexane" dust ("Agrocide" 7) and finely-

ground pyrethrum powder appeared to have a more rapid action, but the most rapid and complete kill was obtained with pyrethrum extract dissolved in kerosene. It was accordingly decided to use this as an emergency measure. Pyrethrum extract containing 25% pyrethrins was added to kerosene to give 0.3% pyrethrins and this was sprayed on very lightly using "Four Oaks Knapsack" sprayers. The high concentration was used to avoid damage to the plants by the kerosene. Unfortunately, much of the spraying was done by unskilled labour, and some of the trees received far too heavy a dose, with the result that a small number died. The results otherwise were quite satisfactory, as very few larvae could be found anywhere on the pawpaw two days after spraying. Those trees which were sprayed as lightly as was intended, were not damaged.

The narrow track between the castor oil and the pawpaw was widened and the earth dusted with "Agrocide" 7, to prevent re-infestation.

A number of adult moths were seen, and it is anticipated that these may become very numerous later.

Castor oil plants on some African plantations were examined. They were found to be also heavily attacked, and it cannot be expected that the area will yield much harvest this year. According to the local natives, these larvae are present every year, but do not normally cause damage. It seems very probable, however, that some reduction in yield is usual, and it may well be that the outbreak of 1952—53 was connected with the unusually dry weather.

Acknowledgement. I am indebted to Mr. E. C. G. Pinhey of the Coryndon Museum, Nairobi, for the determination of the moth *Euproctis rubricosta* Fawcett.

A CHECK LIST OF NATAL BIRDS

Readers who contemplate visiting South Africa will be interested to learn of the appearance of a check list of the birds of Natal and Zululand. This most excellent publication is the work of that indefatigable ornithologist, Mr. P. A. Clancey, Director of the Durban Museum & Art Gallery and is published by that institution.

In addition to being an up-to-date list of all species and races of birds known to occur in the areas covered, a brief account of the status of each is given and details of their distribution. The author is to be congratulated on producing such an accurate and useful addition to African ornithological literature.

The Editor.

SOME SPECULATIONS ON THE SUDDEN OCCURRENCE OF FLOODS IN THE HISTORY OF LAKE MAGADI

By Dr. T. H. White.

Along what is apparently an old shore-line of Lake Magadi, at a level of about 35 to 40 feet above the present level of the soda, limestone moulds ("external casts") of logs and twigs are common. (Fig. 1). They are particularly abundant on the eastern shore of the eastern arm of the lake.

Recently, Mr. P.R.O. Bally, of the Coryndon Museum in Nairobi, gave me a similar mould from Lake Hannington, still containing the remains of a twig. He had questioned the local natives about the occurrence of such limestone-encrusted wood, and was informed that according to their tribal lore a great flood had occurred about thirty generations ago, killing many people and leaving the trees encrusted with stone.

I have never found more than a few fibres of vegetable material within the moulds from Magadi, but it is of some interest that over twenty years ago a twig was dredged up in mud from a depth of 10 ft. 9 in. below the soda. This gave rise to much speculation at the time, and it was sent to the Natural History Museum in London. The report of the Museum authorities was that the twig was, geologically speaking, very recent, and might have been buried for anything from a few days to some thousands of years ! (Stevens, 1932).

At and above the wood-mould level, shells of the giant snail *Achatina fulica* are common. Mr. B. Verdcourt of the East African Agricultural Research Organisation kindly identified these for me, and gave his opinion that they were probably not more than a few hundreds of years old. The species does not occur alive in or near Magadi now, and indeed the only living snail I have seen in Magadi was a solitary specimen of *Bloyetia*. I have, however, found a few fragments of a shell of *Achatina* of much more ancient date in some gravel below an old lake bed, about 100 feet above the soda, some three miles south of Magadi.

Parkinson (1914) and Temperley (1951) comment on the layer of black mud that lies beneath the soda at a depth of about 10 feet. Temperley refers to it as "accumulating at the bottom of the lake." Recent investigations by the Magadi Soda Company Limited indicated that the mud is not in fact at the bottom of the lake, but is merely a layer below which there is a considerable depth of soda.

All of these facts could be explained by a comparatively recent flooding of Lake Magadi, which, if it took place at the same time as the Lake Hannington flood, would have been about thirty *African* generations ago, say 500 years, i.e. about the year 1450. This would correspond more or less in chronology and level with one of the lake levels in the Nakuru area designated G6 by Nilsson (1952). An influx of fresh water would dissolve the top layer of soda, and on evaporating would leave behind it a layer

of mud beneath re-crystallised soda. The occurrence of *Achatina* would fit in with less dry climatic conditions then than now.

If it is accepted that the main pluvials of East Africa in the Pleistocene period were in some way analogous to the chief European and Indian glaciations, there seems to be no reason why lesser pluvials should not be associated with minor climatic changes in Europe. Pettersen (1912) states that the world's most recent period of rigorous climate occurred about the year 1433. This correlates pretty well with the estimated date of the Hannington flood.

Floods of the late Pleistocene pluvials have left considerable beds of silt in the Magadi area. Those that I have had leisure to investigate occur at heights of up to three hundred feet above the level of the soda. Some of these contain wood-moulds, but they also contain rootlet-holes far below the depth that any present-day plants reach. This seems to indicate that during the great pluvials the water of the lakes that formed was not highly alkaline, since no vegetation will grow in soil saturated with alkaline spring-water. Furthermore, compressions and sub-fossils of fish (kindly identified for me by Mr. H. Copley of the Coryndon Museum as *Tilapia nilotica*), which are considerably larger than the present-day small-species *Tilapia* that occur in the alkaline spring-water, are found in these beds and also bear out the conclusion that the water of Magadi was much less alkaline in ancient times than any flowing into the lake today.

Unless the vast soda-deposit of Magadi is of very recent origin this calls for some explanation. In the case of the higher and most distant beds (which extend to the Nguruman escarpment about 20 miles west of Magadi), the comparative freshness of the water could conceivably have been due to dilution. Dilution would probably not explain, however, the features of the lowest beds — the "High Magadi Beds" of Temperley — which do not extend for more than half-a-dozen miles from the edges of the soda, and that only in a north-south direction by reason of the echelon-fault topography of the area.

The High Magadi Beds contain silt of two main types. There is a lower layer, un-varved with an earthy fracture, and an upper layer, varved with a shaley cleavage. Where they overlie the chert series the lower layer rests upon what is apparently a thin layer of colloidal silica, varying from an inch to ten inches in thickness, interspersed with narrow bands of black mud containing black compressions of *Tilapia* in vast numbers. The earthy layer of silt contains only sparse and fragmented fish-remains that require prolonged searching for. In the upper varved layer there are numerous *T. nilotica* compressions at various levels (Fig. 2).

These features are not easy to explain, but it occurred to me that they might be accounted for as follows: Initial intermittent floods brought fresh-water fish into contact with the siliceous springs that then existed, killing them in large numbers and leaving the lower compressions in and just above the silica. Then there occurred a massive flood, bringing down with it the soft unconsolidated lacustrine deposits of an earlier period

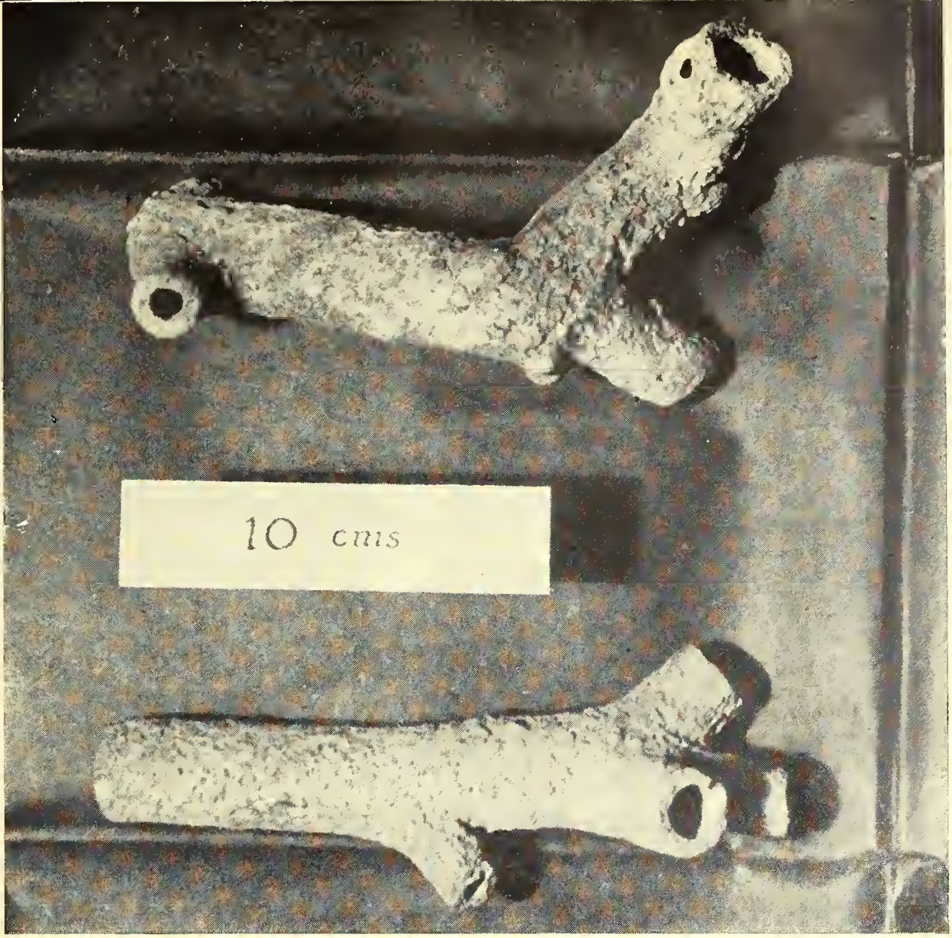


FIG. 1.—*Limestone Twig-Moulds.*

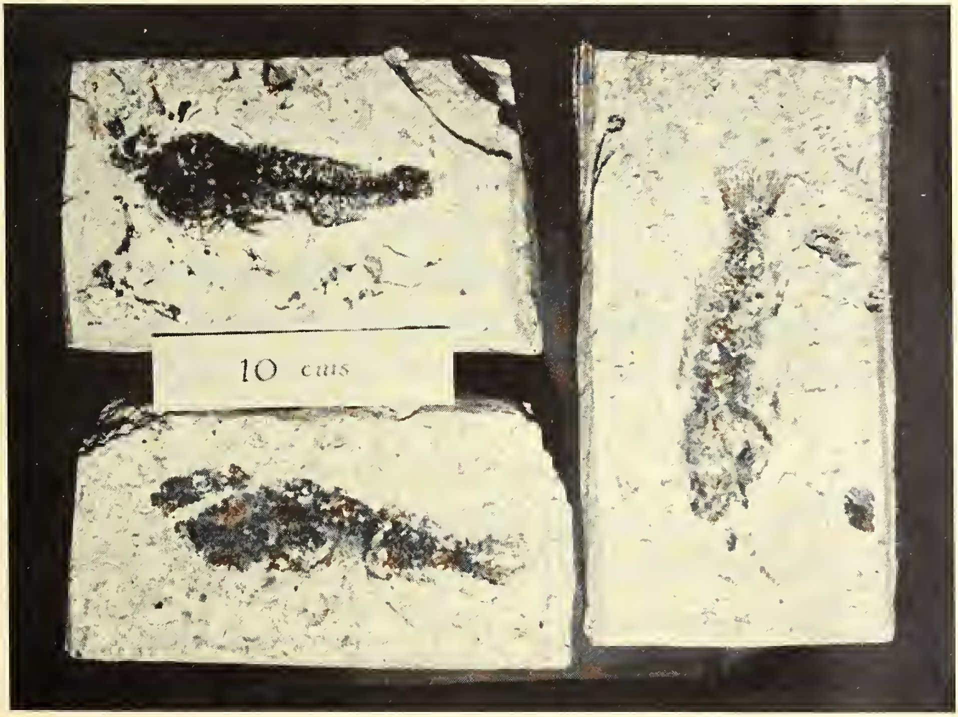


FIG. 2.—*Tilapia nilotica Compressions.*

from the surrounding country, with their fish-remains that became fragmented in the process. This silt rapidly sealed off the silica and the soda so that a comparatively fresh-water lake formed, which in time deposited the varved silt in which the fish that died in dry seasons were well-preserved. A rough estimate of the number of pairs of light and dark bands in the upper layers of the High Magadi Beds is 15,000.

Still earlier floodings could have caused the beds of cherty gravel, partially consolidated into a breccia by siliceous material, that occur near the Hospital at Magadi. Temperley points out that the chert series was probably laid down before the faults that formed the "Magadi Scarp" occurred. These faults probably raised the gravels to their present level. They shew several layers entrapping menisci of alluvium that contain silicified roots and twigs.

The hypothesis of *sudden* floods — much greater than the recent Hannington flood — is not a new idea. Gregory (1921) suggests just such a cause for cenozoic fossil beds of a different nature elsewhere. Such floodings in the Magadi area, over a period of perhaps half a milion years, could account, by frequent recrystallisations, for the extraordinary purity of the soda deposits in Lake Magadi.

A cogent question is "Will the lake be flooded deeply again?" for such a calamity would be of serious economic importance. The answer is yes — but, if the climatological deductions of Pettersen are correct, and if pluvials in East Africa are related to European climates, not for four or five hundred years!

I have to thank the Magadi Soda Company Limited for access to unpublished material, and also Messrs. Bally and Copley of the Coryndon Museum, Messrs. Baker and Thompson of the Kenya Geological Department, Mr. Verdcourt of the Agricultural Research Organisation, and Mr. Saphira of the Kenya Game Department, for their help, and especially for their tolerance of my amateur peregrinations and ruminations.

References

Copley, H. (1953) Personal Communication.

Gregory, G.W. (1921) "The Rift Valleys and Geology of East Africa", London.

Nilsson, E. (1952) "Pleistocene Climatic Changes in East Africa" Proc. 1st. Pan-Afr. Cong. Prehist. 45.

Parkinson, J. (1914) "The East African Trough in the Neighbourhood of the Soda Lakes", Geog. J. xliv. 4. 33.

Pettersen, O. (1912) "Climatic Variations in Historic and Prehistoric Time" Svensk. Hydrog-Biol. Komm. Skrift. No. 5.

Stevens, J.A. (1932) "Lake Magadi and its Alkaline Springs" (Unpublished report to the Magadi Soda Co., Ltd)

Temperley, B.N. (1951) "Report on some Geological and Geophysical Observations in the vicinity of Lake Magadi". (Unpublished).

Verdcourt, B. (1953) Personal Communication.

AMBOSELI NATIONAL RESERVE.

By Merrell Dalton

Amboseli lake, an area of some ninety square miles, still fills in the rains, a time when the National Park lodge is closed to visitors, the game scatters, and the Masai tribesmen are able to move out to other grazing grounds. In the dry months an enormous quantity of Masai stock as well as thousands of head of game are dependent upon the water in the swamp around Ol Tukai where the lodge and Gethin's well known 'Rhino Camp' are situated.

It is truly an amazing sight as the living frieze of animals starts moving across the dry white lake beds to the green of the swamp: a veritable 'sundowner parade' of wildbeeste, zebra, giraffe and gazelle, interspersed here and there with well regulated flocks of sheep and goats and black, white, red and piebald cattle.

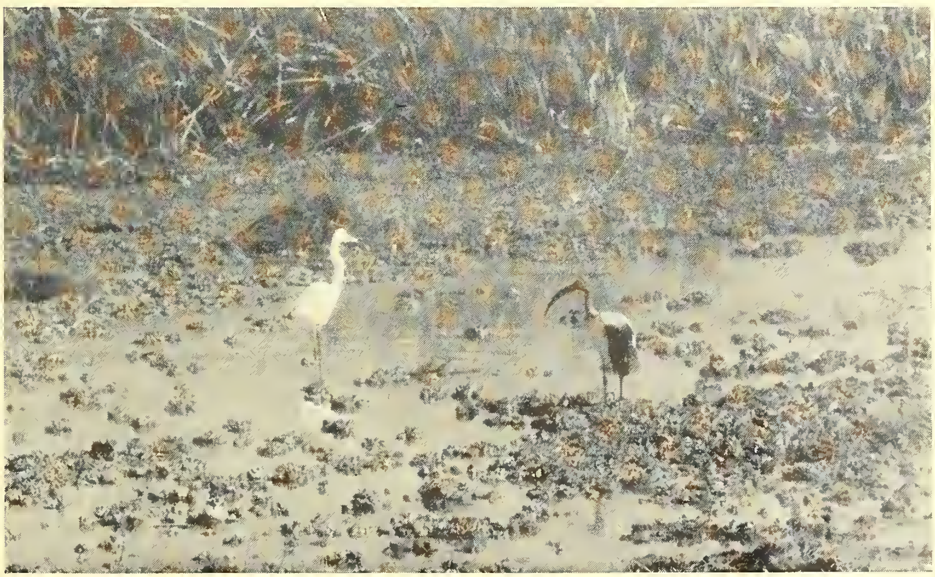
The ground in the vicinity of the swamp is literally pulverised, and a fine dust rises in clouds like white steam, often completely enveloping the entire landscape. On a clear day, however, or before the wind or trampling hoofs disturbs it, the scenery, with its pale lake beds, forests of green-gold acacias, (fever trees), belts of palm and emerald swamps with the background of Kilimanjaro, its majestic dome sprinkled by snow, forms an unforgetable and magnificent spectacle.

Some safari firms now include a tour of the main swamp at Ol Tukai as part of their game-viewing programme when at Amboseli, and, although seasonal, many different species of waterfowl as well as storks, egrets, plover, and the sacred ibis can usually be seen foregathered along the open margin. Colonel Gethin, (Namanga river hotel) who knows this area so well, tells me that large flocks of duck come in with the rains, and are occasionally joined by knob-nosed geese; lily trotters have been noted there, whilst pelicans frequent a small pan, north east of the camp, where water lies out for some time after the smaller soaks have turned to sun-baked mud.

During sundry patrols around this swamp we continually saw white egrets, sacred ibis, Egyptian geese, stilts, the Saddle-billed stork, (a solitary specimen), many small waders which I took to be sand plover, three or four wood ibis, great white herons, grey herons, bittern, and the usual noisy parties of blacksmith plover. Both greese and the sacred ibis were extremely tame and obviously used to visitors !

At the southern end of this swamp there is a tiny spring, hidden among rushes and ferns, where ice cold water bubbles straight from Kilimanjaro's snows. This spring and its overflow feeds the swamp area, and it is quite usual to see elephant, buffalo and sometimes a Bohor's reedbuck feeding along the edge of the reeds and the feathery papyrus. Hippo are in residence at Ol Tukai, but are seldom seen outside in the dry weather

Wildebeeste at Amboseli—Typical Landscape.



Egret and Sacred Ibis—Ol Tukai Swamp.

though their tracks are evident, showing the progress of their nocturnal wanderings. A drive round this vicinity usually produces a "mixed bag" gazelle, dikdik, possibly oryx, (*Callotis*), lesser kudu, rhino, lion, kongoni, cheetah bat-eared fox, baboon in large troops, giraffe, and of course the ubiquitous gnu and zebra.

Visitors will not fail to see Greater bustard which are present throughout the whole of the Amboseli Reserve in enormous numbers, there are plenty of lesser bustard, yellow-necked francolin, Grant's francolin, guinea fowl and plover; ground honrbill are often seen, and those solemn scavengers Marabou storks stand ghoulishly in groups around the water.

One evening no less than four great Bateleur eagles had come there to drink, and a glorious sight they made with their scarlet ceres, beaks and feet, and black, busby-like crests, against the brilliant green of the rushes and grass ! Inside, however, the stand of papyrus is so high and dense that the only indication of feeding buffalo, rhino, or even elephant, is the flutter of the white cattle egrets as they hover up and down deticking their huge charges.

SHORT NOTES

A Species of Door Snail in Uganda

Very few members of Door Snails (Family Clausiliidae) have been recorded from Africa south of Abyssinia.

Austrobalea africana (M. & P.) occurs in South Africa. Two species refered to the genus *Clausilia* (but certainly not belonging to that genus *sensu stricto*) have been found in Tropical East Africa but are so rare and their habitats unknown that no further material has become available for anatomical investigation.

During October 1952 I discovered a single specimen of a snail belonging to either *Balea* or *Austrobalea*. It was on the bark of *Acacia albida* Del. together with numbers of *Succinea* sp. (there are several terrestrial species of this genus in E. Africa) at Moroto, Karamoja District, Eastern Uganda. Despite several hours searching on every available tree no further specimens could be found. Undoubtedly further specimens will be found in East Africa but the record of a single *Clausiliidae* from Uganda is of interest though the species is not known and even the genus uncertain.

Door Snails may be recognised by their elongated, spiral form and brown colour, but see illustration (figure 6) in my Snails and Slugs paper in the present Journal.

B. Verdcourt.

28th October, 1952.

A Meat-Eating Duiker

It would be interesting to hear whether any readers of the Journal have known of a duiker eating meat ?

"Teeka", the young female duiker owned by Mr. Taberer, Warden of the Amboseli National Reserve, ate fresh raw liver, picking the bits out of the dog's plate with evident enjoyment ! She appeared regularly at breakfast time to ask us for small pieces of bread but showed no interest whatsoever in toast, biscuits, vegetable or fruit. The rest of the day was spent foraging around the Lodge among the weeds, leaves, and grass under the fever trees.

I have asked several white hunters and game wardens if they have heard of duikers eating meat but so far no one seems to have had a similar experience.

Merrell Dalton.

The Temporary Preservation of Small Birds with Fine Table Salt.

The simple method described below will enable persons without training in field taxidermy to collect specimens of small birds—up to weaver size—for the Coryndon Museum, Nairobi. Birds preserved by the following method will remain in good condition for at least ten days, probably much longer. It is most important that fine Table Salt only be used.

Method:

1. Open the bird's beak and pack in as much salt as possible, pushing it *well down into the crop* with a match-stick.
2. Burst the eyes with a pin and pack in as much salt as possible.
3. Make an incision over the abdomen (not the breastbone) and remove the viscera with a pair of forceps. Note the sex and condition of gonads. Rupture the diaphragm by pushing the points of the forceps upwards into the thorax. Pack the abdominal cavity and thorax with as much salt as possible.
4. Label the specimen (in pencil) with locality, date of collection, sex, collector and colours of soft parts.
5. Roll the specimen in soft paper or cotton-wool and pack in a cardboard, tin or wooden box and post airmail to John G. Williams, The Coryndon Museum, P.O. Box 658, Nairobi, Kenya Colony. Label the parcel "Natural History Museum Specimens: of no commercial value".
6. Your assistance in adding to our collection will be greatly appreciated. Thank you.

J. G. Williams.

Kalinzu Forest Fruit Bats

On 8 January 1953 Mr. H. C. Dawkins and I were camped at a sawmill in the south of the Kalinzu Forest, Ankole, Uganda, and shortly before

dusk we noticed large numbers of bats flying overhead towards the north, one to three hundred feet above the forest. In the visible part of the sky, which represented a section of the stream of bats less than half a mile wide, we counted them passing at a rate of three to four hundred a minute, from 7.20 p.m. (possibly before) to at least 7.45 when it became too dark to see. We had no evidence of the total width of the bat stream, but there was no noticeable falling off in density on either side of us. The figures indicate that probably more than 10,000 bats were involved.

The great majority of the bats flew steadily and purposefully on their way, but a few weaved among the treetops and half a dozen fluttered round and temporarily settled in a tall *Parinari holstii* in the mill clearing. A specimen collected has been identified as *Eidolon helyum*, a species known to occur in Uganda and western Kenya.

I observed this flight later in the month when I was again staying at the sawmill, so it is evidently a regular nightly movement and not a seasonal migration. I watched for their return one dawn but saw nothing, so I presume it takes place in the dark. Three problems wait to be solved: where do the bats roost, and where and on what do they feed? To the south is partially cultivated grassland with valley forests; to the north lies the forests, then grassy hills with banana shambas in the valleys, and then the Lake George flats. If they feed in the forest, the most likely fruit seems to be the Parinari or Grey Plum, which is the most abundant tree there.

Stanley in "In Darkest Africa" records a similar bat flight when camped near the Aruwimi or Ituri River.

H. A. Osmaston.

NOTICE:

The 11th International Ornithological Congress, presided over by Sir Landsborough Thomson, London, will be held in Basel (Switzerland) from May 29th to June 5th 1954.

During the week of the Congress, 5 days will be devoted to meetings and 2 to excursions. Before and after the Congress (May 25—28 and June 7—19) excursions will be arranged to enable members to become acquainted with the Swiss avifauna, especially in the Alps and Lower Alps. The Congress fee is 30 Swiss francs.

The prospectus, containing registration form and detailed information, will be distributed this summer. Applications to attend and to contribute scientific papers, should be sent in before February 28, 1954 and addressed to:—

XI. INTERNATIONAL ORNITHOLOGICAL CONGRESS,
ZOOLOGICAL GARDEN, BASEL/SWITZERLAND,

which is at disposal for any inquiries needed.

Basel, June 1953....

ESSAY

The Committee of the East Africa Natural History Society has pleasure in publishing one of the prize-winning entries of its recent Natural History Esssay Competition.

WHY DO WE PRESERVE WILD LIFE ?

An Essay by Francis Ojany, aged 17, of the Alliance High School, Kikuyu.

It has been established that there is a close relationship between the lives of plants and animals by which any interference with the one must necessarily affect the other. Nothing lives or dies unto itself; everything is a retainer to some other part of nature. Cats have to do with the clover crop in England and with the incidence of plague in India; earthworms effect the wheat supply and water-wagtails the success of sheep farming. Bees and flowers are hand in glove; the thrush plants mistletoe and ants sow the seeds of the broom. Long chains bind successive generations of plants and animals together and any disturbance of the links making up these biological chains upsets the delicate balance of nature.

To many unthinking people, it would seem that the preservation of wild life in the Colony or indeed anywhere else was a project unworthy of serious consideration or one deserving the expenditure of money and time.

From a purely humane point of view, the idea of killing animals wantonly is surely something rather dreadful and brutal to most men. The indiscriminate destruction of plants is senseless since it destroys something of beauty; cruelty to an innocent dumb creature with feelings possibly as sensitive as our own, is something far worse and unworthy of civilized man.

Before we ever dream of destroying the wild life in the Colony, surely we should try to discover valuable biological relationship between man and animals. In this age of electricity, steam and jet-propulsion, man remains more strangely dependent for his existence upon animal life than upon anything else. He has made animals to be tamed and trained to do work. He uses their products every day of life, and as a result his attitude towards the animals he has subjugated has been wiser than his attitude towards his fellow creatures.

We have much too to learn from the heritage of wild life in the Colony. If we look back into the distant past, we can there learn that man was not the first home-maker; he was not the first engineer; he was not the first to make provision against the morrow. He was anticipated in each sphere by the brute creation; insects, birds and mammals, set an example that he was slow to follow and we may still learn if we so desire valuable lessons from the bee and the ant, the squirrel and the beaver, the gazelle and the lion.

Studies on wild life are now helping to solve the mystery of the past. The testimony of the rocks, brought to light by the palaeontologist, corre-

lated with the examination of the developing embryos of existing representatives of mammals, are making plain many of the details of the long story of mankind.

The importance of preserving the wild life of our Colony further comes home to us when we realise that men and women from all over the world are beginning to want to make regular pilgrimmage to this Mecca of animal life, for one of the greatest attractions of East Africa is the marvellous abundance of its wild fauna. From the point of view of the sportsman and the naturalist, it would be an evil day when the herds of game disappeared from the veldt. Government has wisely guarded against a repetition of the meaningless slaughter which has destroyed the interest and recreation of thousands of men and women in other parts of the world, by carefully considered Game Regulations. These, while liberal to the sportsman, are framed with a due regard to the protection of game. Yet better still are the efforts of those who with imagination and foresight seek to preserve in National Parks and reserved areas, the wild life of our Colony. If the present system is continued and expanded, there appears to be no reason why East Africa should not retain its happy hunting grounds for generations to come.

Today in our National Parks, the plains at most seasons of the year, teem with game of all description and nothing can be happier than an afternoon spent amongst these lovely creatures who are beginning to lose their fear of man and of his weapons of destruction. Nothing could be sadder than the time which is coming and faster than we think, unless we make adequate provision, when the habits and haunts of our wild creatures will be but memories, recorded in books cherished and preserved, written by those who remember, back in those wonderful days, when wild animals once roamed over our Colony and where nature once put on her most glorious show.

OBITUARY

As we go to press we very deeply regret to announce the death of Mr. H. J. Allen-Turner. Mr. Turner was closely associated with the Society from its inception and was a member of committee and vice-president for many years. When the Natural History Society started the first Nairobi Museum in 1911 Allen-Turner prepared the initial exhibits, and from then on he was intimately associated with the work of the Society and of the three successive Museums.

Mr. Allen-Turner first came to Kenya in 1908 as chief taxidermist to the Smithsonian Institution Expedition led by Colonel, later President, Theodore Rooseveldt. He is deeply mourned by a widow and four children. A detailed obituary will appear in our next Journal.

PRINTED IN KENYA BY W. BOYD & CO. (PRINTERS) LTD.

506.67

Journal
of the East Africa Natural History Society

FEBRUARY, 1954. VOL. XXII. No. 3(95)

SMITHSONIAN
AUG 1 1954
LIBRARY

EAST AFRICA NATURAL HISTORY SOCIETY.

PATRONS.

His Excellency The Hon. Sir Evelyn Baring, K.C.M.G., K.C.V.O.

Sir Philip Mitchell, K.C.M.G.

Sir Henry Moore, K.C.M.G.

PRESIDENT.

Hugh Copley Esq., O.B.E.

VICE-PRESIDENT.

R. W. Rayner Esq., B.A., A.I.C.T.A.

EXECUTIVE COMMITTEE.

P. R. O. Bally Esq.,

Colonel M. H. Cowie, M.L.C.

W. Hale Esq., B.A.

J. S. Karmali Esq., B.PHARM., PH.C., D.B.A.

Miss E. J. Blencowe, S.R.N., S.C.M.

J. McDonald Esq., C.B.E., D.F.C.

Miss M. D. Ball.

P. J. Greenway, Esq., O.B.E., D.SC. (HON.). F.L.S.

SECRETARY.

Miss D. Ewing.

HON. EDITOR.

J. G. Williams Esq., M.B.O.U.

HON. TREASURER.

W. R. Bowles Esq.

HON. LIBRARIAN.

R. A. F. Brenan Esq., M.A.

All correspondence in connection with this Journal should be addressed to:
The Hon. Secretary, P.O. Box 658, Nairobi.

Journal
of the East Africa Natural History Society

FEBRUARY, 1954. VOL. XXII. No. 3(95)

Cover Design — 'VULTURES IN FLIGHT' — by P. R. O. Bally.

CONTENTS

THE IDENTIFICATION OF KENYA BIRDS OF PREY IN FLIGHT. PART 1, VULTURES.

By J. G. Williams.

Birds of Prey in general — there are some exceptions — with their confusing sequence of immature and adult plumages form a group which the beginner finds difficult to identify in the field. Even with the aid of the various well-illustrated bird books which are available in East Africa the recognition of raptorial birds is not easy. Descriptions in such books are usually adequate when one is working out the identity of a dead hawk and helpful when one can examine a resting bird through glasses. But they fall short of the ideal where a bird of prey flying overhead is concerned. The object of this series of papers is to fill this gap in our literature.

Anyone desiring a wider knowledge of our birds of prey is strongly advised to make use of the study collections housed in the Bird Room of the Coryndon Museum, where a series of specimens of most species, illustrating age variation and dimorphism, may be laid out for inspection. It is only by studying such specimens in addition to the perusal of the literature that one can really get to know our vultures, eagles and hawks.

The Vultures.

The appearance in flight of vultures as a group is rather difficult to define. Briefly their smallish heads, generally broad wings and short tails are diagnostic. Vultures are also more likely to congregate in the air in numbers than is usual with most other birds of prey.

Rüppell's Griffon Vulture.

Gyps rüppellii rüppellii (Brehm). Plate 1.

Adult. Wingspan 8 feet. The two main distinguishing features are the scaly or spotted appearance of the underside of the body (formed by dark brown feathers with whitish-buff tips) and a series of narrow white lines, sometimes broken, on the underside of the wings. At close quarters the bill is seen to be pale greenish-grey.

Immature. Differs from the adult in being brown, streaked blackish below, with a narrow white streak parallel to the fore edge of the wing. In this plumage extremely difficult to distinguish from the immature White-backed Griffon, but slightly larger.

White-backed Griffon Vulture.

Pseudogyps africanus (Salvadori). Plate 1.

Adult. Wingspan 7 feet. The White-backed Griffon has uniform pale buff underparts, a dark crop patch, black head and bill and a broad white band along the fore edge of the wing. In some examples the white wing band is much broader than is shown in the illustration.

Immature. Underparts dark brown with indistinct blackish streaking. Very like the immature Rüppell's Griffon but a little smaller.

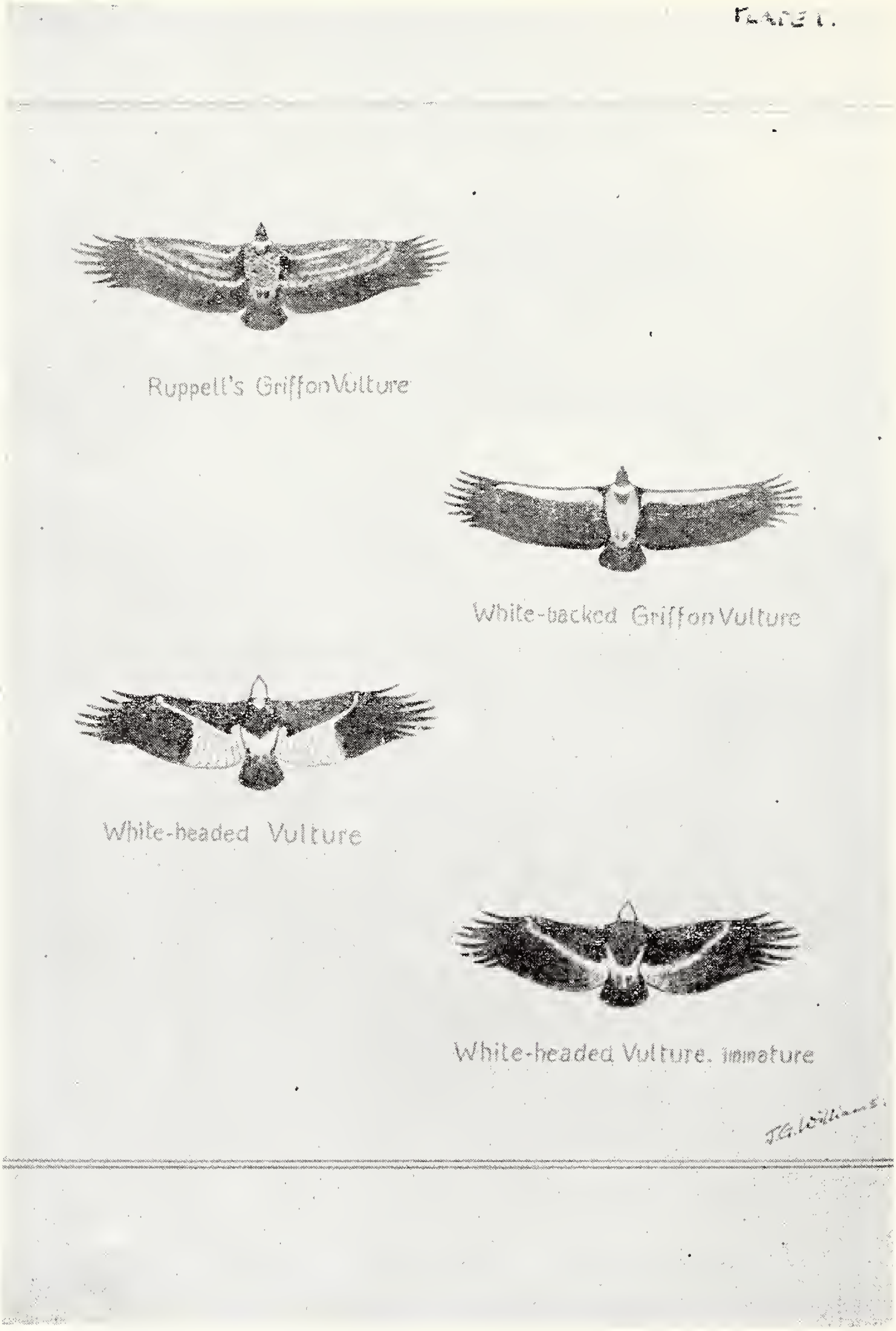


PLATE 1. *Vultures in flight.*

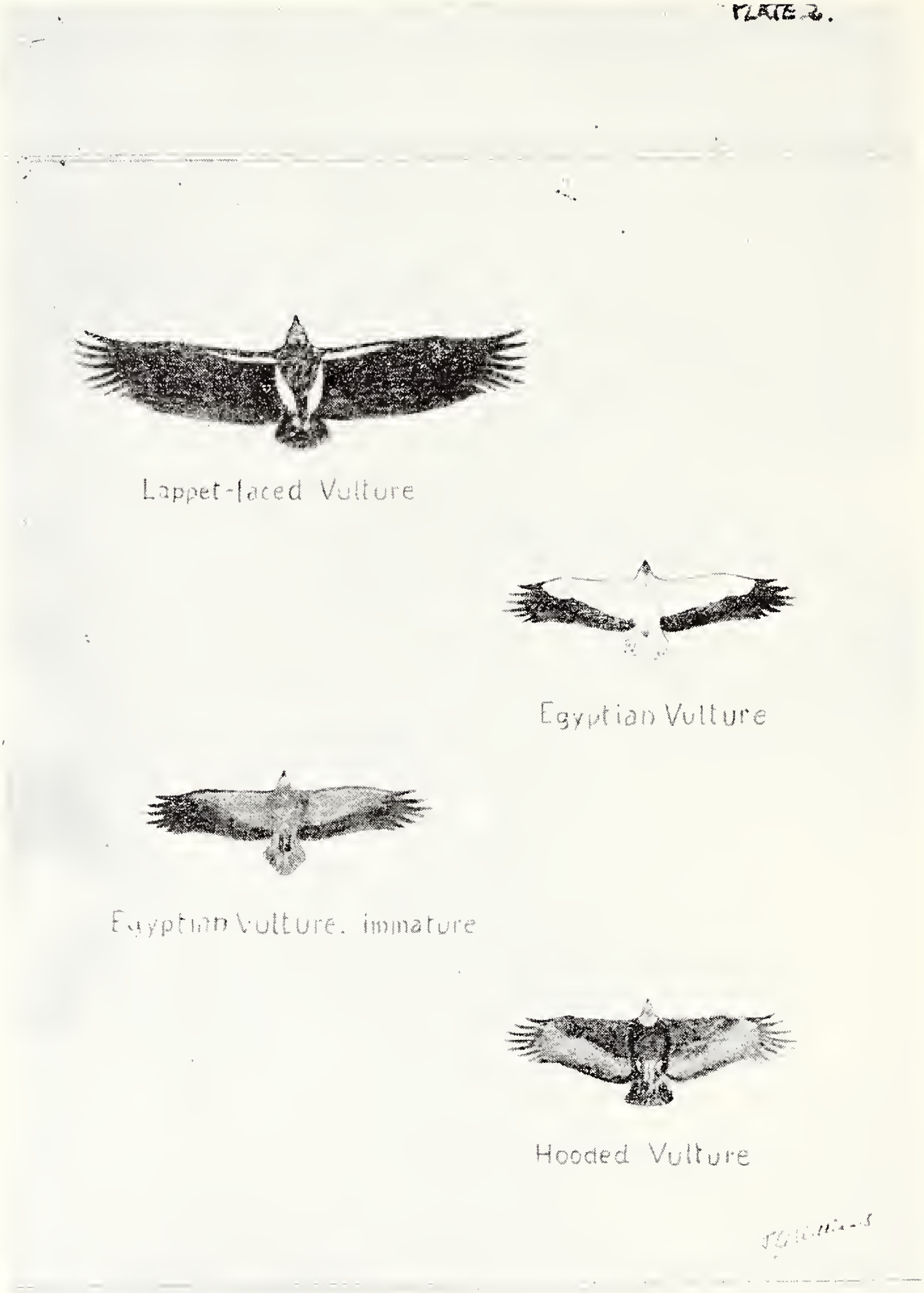


PLATE 2. *Vultures in flight.*

Nubian or Lappet-faced Vulture.

Torgos tracheliotus nubicus (Smith). Plate 2.

Adult. Wingspan 9 feet. This is the largest and most powerful of our vultures. Underparts of body blackish-brown with two contrasting white thigh patches and a short white streak along the fore edge of the wing. The reddish head and large bill are good field characters at close quarters.

Immature. Resembles adult but thigh patches often brown, not whitish.

White-headed Vulture.

Trigonoceps occipitalis (Burchell). Plate 1.

Adult. Wingspan 7 feet. This is a very distinct species. Its field characters are white head, blackish breast, white abdomen and thighs and dark wings with a large white secondaries patch.

Immature. Differs from the adult in lacking the white secondaries patch, but has a conspicuous white line bordering the under wing coverts; abdomen and thighs usually mainly white (see plate 1).

Egyptian Vulture.

Neophron percnopterus percnopterus (Linnaeus). Plate 2.

Adult. Wingspan 5 feet. In adult plumage the Egyptian Vulture is easy to recognise, being entirely white except for black flight feathers and a yellow face, the tail is diamond shaped.

Immature. The first immature plumage is entirely brown, followed by a grey, then a grey and white dress until the bird reaches maturity. It is best identified by its diamond shaped tail and rather narrow wings. The Hooded Vulture has broad wings and a short tail.

Hooded Vulture.

Necrosyrtes monachus pileatus (Burchell). Plate 2.

Adult. Wingspan 5 feet. This is an entirely dark-plumaged vulture with broad wings and a short tail; there is sometimes a little white on the crop and thighs, and the wings have a curious silvery lustre in certain lights.

Immature. This plumage is very like that of the adult from which it does not differ in any important detail in flight.

BIRD NOTES FROM MOLO — 1. THE DAM.

By MRS. D. M. SHEPPARD.

To any bird lover a stretch of water, however small, is an irresistable attraction; there is always something to watch. If one's hopes of seeing a rare duck or wader are rarely realized there are still the birds of the reeds and grass verges, the birds that come down to drink and those that fly overhead.

Since I came to live up here just eighteen months ago the bird life of our dam has proved a fascinating study, particularly having regard to our altitude which is nearly 9,000 feet. The dam is quite small, only about three acres, very shallow and weedy, lying at the foot of a steep hill on the edge of the forest.

Last year, when there was still plenty of water our more common residents were two pairs of Red-knobbed Coots, which bred in July, Dabchicks, Moorhens, Black Crakes and Yellow-billed Ducks varying from a solitary pair to forty or fifty. African or Southern Pochards were fairly regular visitors and sometimes we would have a pair of the attractive Red-billed Teal or their more drab cousins the Hottentot Teal. In April of last year a solitary Garganey was seen on two occasions, presumably on migration. In August I was excited to spot my first White-backed Ducks and so fast asleep were they (a party of five of them among the water-lily leaves) that it took me some time to identify them, their white backs only showing when preening or in flight. They remained with us almost continuously until the dam started to dry out in December.

Our most common small waders are Green and Wood Sandpipers, the latter very tame and in large numbers in February when the rapid drying up of the dam made conditions ideal for them. During this month a Marsh Sandpiper was also seen and the Common Sandpipers visit us occasionally. In December and again in February we were lucky to have a pair of Stilts for a few days. In January and February two pair of Snipe became temporary residents of the grass verges. They would sit so tight that they were in danger of being caught by the dogs. Whether they were the Ethiopian or Common variety we were never able to discover.

In July I went to England for three months and returned to find the dam empty save for a few small puddles but one pair of faithful Wood Sandpipers were still with us and an occasional Green one still visits us.

Of the large wading birds, we have had Grey and Black-headed Herons, Hammerkops, Yellow-billed Egrets and the stately Kavirondo Cranes as regular visitors. Sacred Ibis and White Storks were seen in February, and in May, for the first time, we had a Saddlebill Stork. I have always associated this magnificent bird with lower and warmer regions but he

seems to like it up here and has been a fairly regular visitor ever since. But our greatest thrill was when, one day last month, we spotted two strangers stalking about the dry floor of the dam and these turned out to be a pair of Woolly-necked Storks (*Dissoura episcopus*). Their visit, alas, was all too brief, for as we were watching them from close by a Mountain Buzzard swooped out of the forest and saw them off in no uncertain fashion. They circled over our heads, then up and up they soared to such a tremendous height that even through our field glasses we could no longer see the two specks that were our Woolly-necked Storks.

But it was not long before we had another new species to add to our list. About three weeks ago a solitary Black Stork (*Ciconia nigra*) appeared and at the time of writing (November 26th) is still with us. He is a big bird, a good deal bigger than Abdim's and very smart with his red legs and bill.

And what of the little birds that find their living around the dam and among the rushes ? Wagtails are the most numerous and varied. Wells' and the African Pied species are residents — the latter, though, preferring the garden to the dam. During the winter months we have large numbers of Yellow and Blue-headed, and solitary Grey Wagtails have been seen on migration.

Yellow-throated Long-claws and Pipits (species unidentified) are also residents as is the ubiquitous Stonechat. At intervals large flocks of Masai Waxbills swarm among the rushes and sometimes we are lucky enough to have an influx of the beautiful Malachite Sunbirds — though what should attract them to the dam, where they perch on the rushes, I have never been able to discover.

And last, but by no means least, mention must be made of the birds of prey that are so much part of the life of the dam. Augur Buzzards, Mountain Buzzards and Crested Hawk Eagles are always to be seen somewhere near and in the winter months African and European Marsh Harriers and Pallid Harriers quarter in fields around. All these species have been seen on many occasions motionless on the ground either on the edge or on a tuft of grass in the middle of the dam, the male Pallid Harrier looking from a distance very like a seagull. The ducks are very nervous of these birds of prey, particularly the Harriers, and when the water is too low for them to be able to take cover in the rushes they become so jumpy that they will make off as soon as one appears in sight, often before I am able to spot it. The sandpipers, on the other hand, take little notice of them.

On one occasion our dogs put up a Marsh Owl in the long tussock grass near the dam. It flew a short way then flopped down in the grass again, repeating this several times and never going far away.

And so when my husband comes in from riding or I from walking before breakfast, the first question usually is — "Seen anything new on the dam today?" and there is nearly always something of interest to record or discuss. Life is never dull with a stretch of water nearby.

AFRICA'S RAREST COWRIES.

By LLOYD E. BERRY, LOS ANGELES, U.S.A.

There are places in the world where collectors of marine shells may find a greater number of species than is provided by the African coast, but the "Dark Continent" has the distinction of providing some of the most interesting and rarest shells.

Many shell enthusiasts collect all groups or families of shells; others concentrate on certain families such as the *Cypraeidae*, more commonly called Cowries.

Cowries are considered to be the "aristocrats" of all shells, for in their natural state they are found with a high glossy polish and need no human means of bringing forth their beauty.

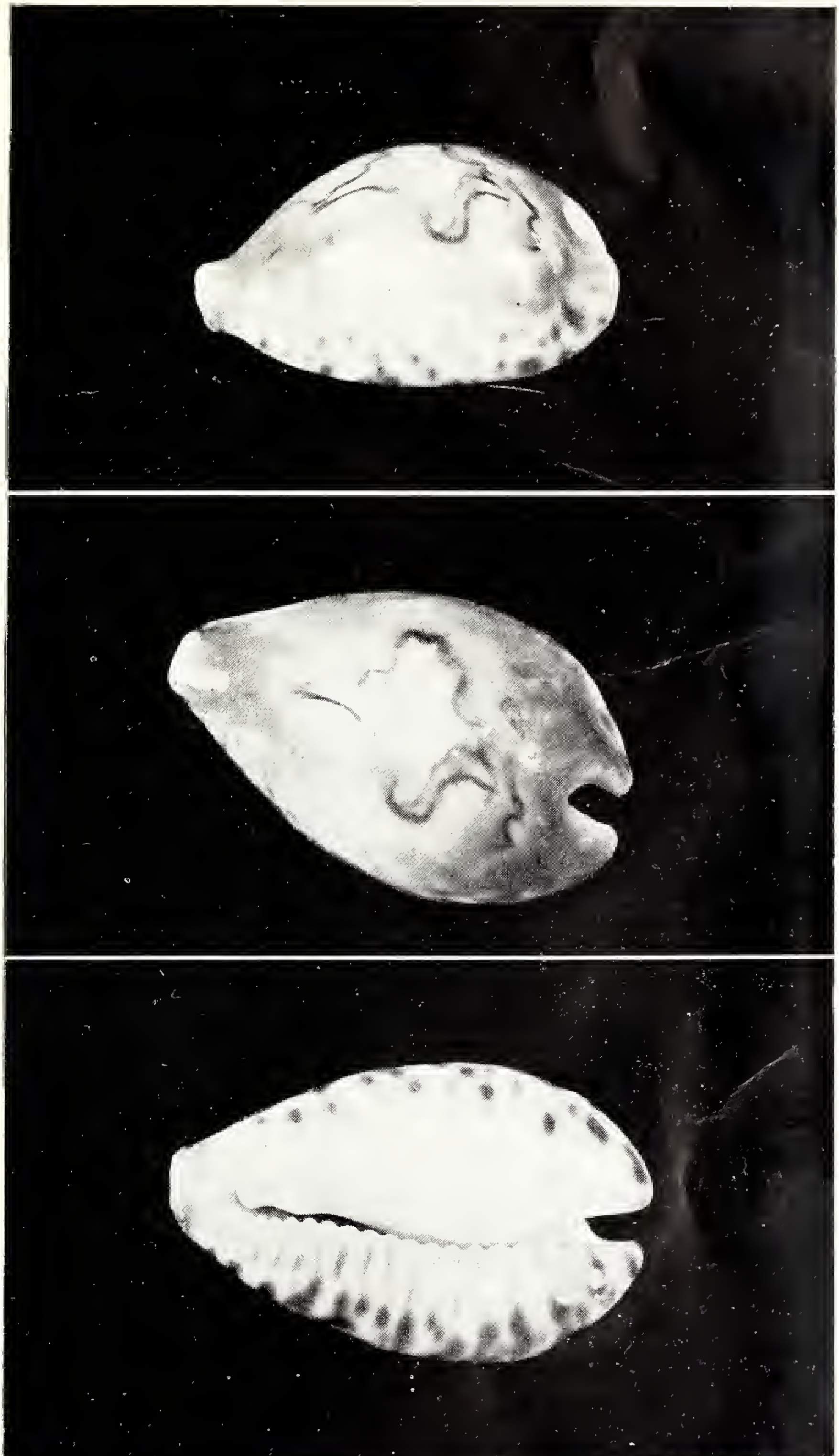
The east coast of Africa offers over 45 species of cowries for collectors who know where and when to search. The south-east coast from Mozambique to the Cape offers a large number of these, among them some of the rarest.

As many of the East African cowries are quite common over the whole of the Indian Ocean, east to Australia thence north into the Pacific Ocean, we will attempt to list only those considered rare or semi-rare. The names as given are first the genus, then the species followed by the name of the authority or person's name who described the particular species.

The East African cowrie that seems to be number one on all collectors' lists is the one known as *Bernaya fultoni* Sowerby. The exact number of this species in collections is not known, but it is certainly very few. However, it is not a cowrie to be had by combing the beaches unless perchance a dead specimen has been washed ashore by storms. (See figure)
It is a deep water shell, usually obtained by dredging or trawling. Another source is the stomach of a fish commonly called the "mussel-cracker" which seems to prefer molluscs of various sorts for its food instead of small fishes.

The collector who is acquainted with fishermen or with people working in the canneries should have a better opportunity of obtaining this species if he is not already equipped with a boat for dredging or trawling. If fishermen would only realize it, the value of this shell is greater than the fish within which it is found!

Bernaya fultoni is easy to identify for it is among the larger cowries, the average size being from 55mm to 70mm in length and 35mm to 40mm in width and height. It can be called pear-shaped with the top being quite humped. The dorsal or top markings are irregular and scattered,



One of Africa's Rare Cowries, *Bernaya fultoni* Sowerby. The specimen illustrated above is in the collection of Mrs. H. Boswell of Johannesburg, to whom the Society is indebted for the photographs. (x 0.9)

of a reddish-brown or chestnut colour on a light background. The lateral or side markings become a series of large dark spots which carry part way over on the base, which is white. The teeth on both columellar and outer or labial lips are coarse and red in colour. The known locality for this shell is around the Natal coast and specimens have been collected in St. Francis Bay.

Cypraeovula amphithales Melvill is also a South East African cowrie ranging from Durban to Port Elizabeth. It is considered rare. To the beginner or unobserving collector this shell may be and has been mistaken for the more common *Cypraeovula capensis.* However, its average size is 24 to 27mm which is 3 or 4 mm shorter than *capensis* in length. The dorsum or top of *amphithales* is smooth whereas the ribs or ridges and grooves on *capensis* continue over the top from side to side. The sides or lateral zones of *amphithales* are spotted and on the few shells I have observed the left side was spotted so densely that they became almost a solid dark pattern or wide line along the full length of the shell. This never occurs in *capensis.*

Both of these species have a pale brownish to yellow background with an irregular dorsal blotch of a darker brown. The dorsal blotch on *amphithales* is weak and irregular and could be called just a group of irregular markings whereas the dorsal blotch on *capensis* is solid or just one marking.

As I have never seen a fresh specimen of *Cypraeovula fuscorubra* Shaw I can only give the minor details of it from drawings and photographs which I have seen. It is sometimes known as *C. similis* Gray. It occurs around the Cape Hope region and my one dead specimen is from Cape Agulhas. Schilder's book on the Cypraeas lists this shell as common but I have found it difficult to obtain, even from collectors who live where it occurs.

I presume it to be a deep water shell and dead specimens are washed ashore by storms. The dead specimen at hand measures 41mm in length. The columellar teeth are short and do not extend over the inner lip. The teeth on the labial or outer lip are also short but more coarse and extend the full length of the lip. The aperture is wide, especially so at the anterior end. The shell is gibbous or swollen and inflated. The left side is round and full with a convex base, whereas the right side has a rather heavy margin which continues the full length of the shell and over both terminals. The base in fresh specimens is a pale rust colour and the teeth are white. The dorsum or top is of a dark rust colour, darker than the base and has no spots on the top or sides. This shell is not to be confused with the common *Cypraeovula fuscodentata* which appears in numbers around Port Elizabeth and Port Alfred.

I am sure that most collectors in the area of Algoa Bay, Port Alfred and East London are familiar with the little *Cypraeovula edentula* Gray

which is about 5/8 to 7/8 of an inch in length or approximately 22mm. This cowrie is rated as common in its area and has a pale tan background with an irregular dorsal pattern of darker tan or brown with dark brown spots on both sides; the right side has a heavy margin while the left side is smooth and rounded or inflated. The teeth in *edentula* are almost obsolete.

I mention *edentula* only for comparison with the little *Cypraeovula algoensis* Gray, which appears much the same in shape, size and colour until one observes the base. In *algoensis* the dorsal colour may be more light in shade but both lips are adorned with teeth. The occurrence of *algoensis* compared to *edentula* is in the ratio of about 1 to 200, therefore I place it in the class of being rare.

Palmadusta contaminata distans Schilder can be classed as very rare for there are very few of these in collections. It is considered large if over ½ inch or about 13mm. The teeth are small to obsolete, the right side is margined. The colour of the top is pale yellow or cream with faint brown spots, the spots being more numerous on the sides. The teeth and base are white.

The South East African *Palmadusta ziczac* is called variety or subspecies *misella* Perry. Its average size is slightly larger than *Palmadusta contaminata* and is from 16mm to 18mm in length. The colour is an off-white with a series of zigzag or arrow markings of pale brown or chestnut. The base and teeth are yellowish. This shell is not to be confused with *Palmadusta diluculum* Reeve; *diluculum* is large, very dark and much more common than ziczac, although at one time it was called by that name due to its pattern.

Erosaria marginalis Dillwyn. Although this cowrie is most uncommon its range extends from northern Kenya to the northern Cape Hope area. Its average size is about 1 inch or 26 mm and it cannot be confused with any other cowrie in this area. Its ground colour is a pale rust with a trace of lavender throughout. The terminals and base are lavender in colour. The columellar teeth are numerous but short while those on the labial or outer lip are slightly larger and coarser but less in number. The pale rust coloured dorsum is marked with numerous dark brown spots interspaced with pure white spots about one half the size of the brown ones.

The only shell that comes close to *marginalis* in appearance is *Erosaria helvola* but *helvola* lacks the lavender colour on the base. *Helvola* is also a much heavier and solid shell. Its average size is also smaller.

Africa offers many other rare cowries on its northern coast. There are also several on the west coast rated from common to rare but there seem to be few collectors around Cape Verde where they occur, consequently there are few of these in collections.

Collectors searching for cowries will be wise to confine their hunting to rocky shores and coral reefs. Many cowries prefer to remain under rocks and are inclined to avoid sandy beaches for the grains of sand get under the mantle and cause irritation. However, a few in the Phillippines do bury themselves in coarse sand, like members of the olive family.

With the latest improvements in the aqua-lung, skin divers are able to go to greater depths (over 100 feet) and many cowries are now being collected from reefs and rocky bottoms that before were not obtainable except as dead specimens washed ashore.

For the benefit of those who are not familiar with the curing and cleaning of cowries, it is well to know that these shells can be ruined by improper cleaning methods. Many believe that boiling will blister or crack the shell but I have had very good luck with this method but only by placing the shells in cold water and bringing it to a boil for not more than two minutes, then allowing to cool slowly.

Blistering and cracking is caused by dropping the shell in water that is already boiling or dipping them in cold water while still very hot, causing too sudden contraction or expansion.

A slower method is to place the shells in cold water and let the meat decay. The water should be changed every 48 hours for a week or ten days.

Some good results have been obtained by placing the shells overnight in the ice compartment of an ice box or refrigerator as this causes the meat to shrink.

In all cases, a small knife and bent wire are handy tools for removing the animal.

To make a collection more interesting and of greater value, always label every specimen as to locality, date found and the name of the collector. Other information may be written on the label but these three items are essential. In the event of exchange other collectors will request exact data with specimens.

Some families of shells are seldom found alive but whenever possible it is better to collect live specimens. Dead shells have little value unless very rare.

Experienced collectors avoid specimens which have been dipped in varnish or lacquer to make them shine or look pretty. Cowries have a natural polish and do not need any help from mankind to make them look beautiful.

ENGLISH NAMES FOR KENYA MOTHS

By A. L. H. TOWNSEND.

In the number of this Journal for April 1953, Col. Stockley makes the suggestion that someone should invent English names for the Kenya months. This wholly admirable suggestion has been made more than once; but it does not appear to have been taken up. "Admirable", because there can be little doubt that many potential entomologists, particularly among the younger generation, are scared off a study where they find such mouthfuls as *Sphingaeniopsis*, *Odontocheilopteryx*, and *Thaumetopoea apologetica* to be common and necessary currency. It has often been noticed how few and how small the insect collections are that appear among the Schools' exhibits at the Agricultural Shows: a fact which seems to show lack of interest in entomology among the young people of the Colony. Why does this difference exist between the children of Kenya and those of England, who are at present showing more interest than ever before in the study of insect life? There must be some reason, in a country where insects are so numerous, interesting, and beautiful. Is it partly because of this matter of the names? If so, cannot simple English names be introduced to supplement those monstrosities (necessary to the scientist, but not, at first anyhow, to the ordinary person) mentioned above? This article has been written in the hope that it may start the ball rolling. It is purely tentative, and deals with the Moths only; my knowledge of the Butterflies is too slight for me to venture on any suggestion of names for them. There are many people far more competent than myself to undertake that.

There are difficulties, not the least of which is that many of our Kenya Moths may already have acquired names elsewhere — in South Africa, for instance — and to name them here might lead to confusion. But this would be straightened out in time, and does not seem to be a sufficient reason for postponing an initial effort. To invent an individual name for each of the enormous number of our moths will be a vast task, and take a very long time. But, again, that does not seem to provide a valid argument against making a beginning.

Certain principles may be suggested, to begin with.

1. Species with names already well-established in England will, of course, retain them. There are more of these in Kenya than may be generallly known.

2. The use of "Kenya" — or of any Kenya locality — as a prefix, should be avoided, since it may well prove, later on, to be inappropriate. The species may not be confined to Kenya, or to the particular locality. (Anyone who has studied the African moths will know that there are a very large number with the scientific name "capensis", which occur in many places besides "The Cape").

3. Where the scientific name is clearly descriptive of the moth, or of some individual characteristic or peculiarity, it should be translated and retained. An instance of this is "*hirundo*", the Swallow; surely a most happy name for this delightful little Hawkmoth.

4. Well-established Group-names, such as Hawks, Tigers, Footmen, Pugs, etc., should be used when possible; that is, when their use does not make the name unwieldy.

5. Some Group-names however, such as Carpets, Rustics, Arches, have been stretched almost to absurdity in the English list. These should not be further extended.

6. "Proprietary" names; Wahlbergi, Platti, Jacksoni; should only be retained in English if no more elegant or appropriate name can be found.

7. Names should be easily intelligible, and not grotesque or absurd. (How many English entomologists can say what is meant by "The Engrailed Clay", "The Cousin German", or "The Setaceous Hebrew Character"? Or what could be more grotesque than "The Beautiful Snout"!)

Here are a few suggestions, made with great diffidence, and covering only a few species from a small number of Moth-families.

SPHINGIDAE (Hawkmoths).

There are five of these in Kenya with well-known English names, the Death's head, Convolvulus, Oleander, Striped, and Silver-striped Hawks. These need no new names.

Suggestions :—

H.osiris	Greater Silver-stripe.	*H.eson*	Olive-striped Hawk.
H. balsaminae	Clay-striped Hawk.	*L.hirundo*	Swallow or Swallow hawk.
M trochilus	Lesser Hummingbird.	*B.medea*	Green Jewel.
B.charis	Rose-and-silver.	*P.grayi*	Brown-tipped Hawk.
P.falcatus	Hook-tipped Hawk.	*Ps.postica*	Black-based Hawk.

SATURNIIDAE.

Since the only English species is the well-known "Emperor", it seems that it may be well to keep this name with appropriate prefix, at least for those species with "target" markings on the wings. It may be necessary to keep the many "proprietary" names in this family: e.g. *Nudaurelia rothschildi*, Rothschild's Emperor.

ARCTIIDAE.

The "Footmen" lend themselves to descriptive names. *D.pulchella* is already known as the Crimson-speckled.

E.peperita	Dusty footman.	*E.sanguicosta*	Red-edged footman.
E.distigmata	Colon footman.	*E.discifera*	Cloudy footman.
L.bipunctigera	Twin-spot footman.	*M.chalybeata*	Steely footman, etc.

SYNTOMIDE.

A few well-known species :—

A.chrysozona	Gold Belt.	*Th. negus (phasma)*	Phantom.
M.lateritia.	Vermilion.	*M.flavivena.*	Yellow-veined.

NOCTUIDAE.

There are a number named in England; *C.loreyi*, Cosmopolitan: *Eux.segetis*, Turnip moth: *Eux.spinifera*, Hubner's Rustic: *H.peltigera*, Bordered Straw; and several others. I will suggest names for species of two Genera only out of this immense family.

Plusia.

P.limbirena	Broken Y.	*P. orichalcea*	Brass-wing.
P.indicator	Pointer.	*P.sestertia*	Plutocrat.

Othreis.

O.materna Chequered Orange-wing. *O.fullonica* Comma Orange-wing.
O.divitiosa Broad-bordered Orange-wing.

Those few will suffice to show the idea I have in mind.

To bring this project into being will require co-operation — much co-operation. It is possible, even probable, that in the Kenya Schools or elsewhere, there are names already current of which I am ignorant. If anyone interested cares to send me these, or suggestions for others, I will do my best to proceed with the next step, which is to secure the adoption and publication of the names. One stipulation however is necessary. The name, or suggested one, *must* be accompanied by the scientific name of the moth. (This can easily be obtained from the Museum) The reason is clear. A communication saying "A good name for that common moth, white with red blotches on the wings, would be 'Nettle-rash'" will not be very helpful. It is almost impossible to recognise a moth from a casual description.

In this matter of adoption and publication, the help of the Natural History Society, and of the Coryndon Museum, will clearly be necessary, and I feel sure that it will be forthcoming. Both these institutions are keen to increase the number of Naturalists in the country, and realise that one way of doing so is that now suggested — the provision of "easy" names for the insects. Perhaps a small committee might be set up to accept or reject suggestions, and to choose between alternative ones. Perhaps the Editor of this Journal would agree to publish occasional lists and the Museum authority to incorporate the new names in the label-system of the collection. At any rate, the first thing is to get a list of names. Let us get on with it.

COMMON NAMES FOR MOTHS — ANOTHER VIEW.

By E. C. G. Pinhey.

Mr. Townsend's suggestions for common names for moths are admirable in many ways. If we lived here in a geographically confined space like Britain, or like Mauritius to come nearer our Region, I would say by all means use popular names for all our larger *Lepidoptera*, our so-called "Macrolepidoptera". In our unconfined tropical zone, however, we have many thousands of moths which fall into the above category and having myself attempted to use common names for all the four hundred and sixty odd species of butterflies in Southern Rhodesia I have modified my views about extending such titles further.

The lack of popularity with moths in Africa is not just due to the scientific names. In Europe, for instance, while British amateurs have strings of common names for moths, collectors on the Continent are not blessed to this extent with such encouragement. Yet there is no dearth of continental collections of moths. Again, there are many beetle collectors in Britain and although many of these (beetles) are of striking appearance only a few have popular names — more so in the case of groups than species. Who, for example, would be so rash as to try and popularize the genus *Apion* with common names? Attempts have been made in Engand to tack such names on to insects of other families without marked success. Even the amateur Lepidopterist in Britain must learn specific names if he is to mingle with older collectors or join societies.

No, it would appear that the main cause of the lack of interest in African moths is the shortage of comprehensive, popular, well-illustrated literature. What are the reasons for this state affairs? Firstly the overwhelming number of species of moths (or other insects) in almost any African territory. Secondly the shortage of collectors and entomologists with spare time and sufficiently versed in the subject to write books on them. Thirdly the cost of publication of well-illustrated works. *

If the general opinion is in favour of popular names then they must, for practical reasons, be confined to the two most popular families of moths, *Saturniidae* and *Sphingidae,* both containing highly attractive insects and neither being overwhelming in number of species. To attempt names for other families, such as the thousands of *Agrotidae* (*Noctuidae*!) would be like plunging into a morass, complicated enough as it is to the advanced student and beyond the pale for the beginner.

* Mr. Pinhey is working on a general book on African entomology — "An Introduction to the Study of African Insects." Editor.

AN EXPLANATION OF SCIENTIFIC NOMENCLATURE.

A Glossary of scientific names, commonly found in East African Ornithological Nomenclature.

By D. G. MacInnes, Ph.D., M.B.O.U.

It is a common, though entirely erroneus belief, that the "latin", or scientific names of birds and animals are invented, without rhyme or reason, by the experts, with the dual purpose of impressing and confusing the amateur. Moreover it is thought that one of the primary requirements of such names is that they should be long, complicated and unintelligible. The following notes and glossary are therefore put forward as an attempt to explain briefly the system employed, and to enable the amateur to understand some of the names which, at first sight, appear to be so incomprehensible.

Colloquial names vary not only in different countries, but also from district to district, and it was partly owing to the resulting confusion that the great Swedish naturalist Linné (Linnaeus) devised a method, published in the 10th edition of his "Systema Naturae" in 1758, by which the entire Animal Kingdom was classified and divided into groups, or species, each of which was given two scientific names. In order that they should be of international value, Latin or Greek names were used. The first, or generic name, indicated a relationship within a group of species, whilst the second, or specfic name, distinguished the related species from one another. Thus the Mistle-Thrush, Song-Thrush, Fieldfare, Redwing, Blackbird etc., being clearly allied species, all have the first name *Turdus*, which is the Latin word meaning a Thrush. Occasionally, as in this case, the generic name is just the Latin or Greek word for the group, but more often names are composite words drawing attention to some characteristic feature of the species (e.g. *Turdus viscivorus* = Mistletoe-eating Thrush = Mistle-Thrush).

In the days of Linnaeus, ornithology was not the highly developed science that it is today, and although the original classification is largely maintained, it has been necessary to subdivide some genera into subgenera, and many species into sub-species or races. For this reason a trinomial system of nomenclature has been introduced, and in addition to the generic and specific names, many birds have been given a third name, known as the subspecific- or racial-name. The subspecies is usually distinguished on geographical grounds, coupled with some recognisable variation in colour or form, and the third name thus often indicates the locality, consisting of a place-name wth the latin suffix *—i*, *—ae* or *—ensis*. Where a species has been divided into two or more subspecies, the one originally described is known as the "nomino-typical" race, and the third name is then merely a repetition of the specific name.

For instance, in 1823 Lichtenstein described the Cape Rook under the name *Corvus capensis*. In 1919, Laubmann pointed out that in the province of Kordofan a smaller form occured, which he named *Corvus capensis kordofanensis*. Thus the original South African race becomes *Corvus capensis capensis* Licht.

The ornithologist who "invents" a name to describe a new race or species, is known as the "author" of the name, and when referring to a bird by its scientific name it is customary to add the name of the author. Many bird-names date back to Linnaeus or other early ornithologists, and in some cases subsequent research has shown that a group of species originally assigned to a single genus, really represents two or more genera, which must be named separately. In this case the name of the first author is put in brackets, to indicate that the name now employed is not exactly as originally proposed. For example, Linnaeus included the Rock-Thrush with all the other Thrushes, and called it *Turdus saxatilis,* but in 1822 Boie showed that it was generically distinct, and proposed the new generic name *Monticola*. The name therefore is now *Monticola saxatilis* (Linn). In this case, since no subspecies have been described, it is unnecessary to duplicate the second name.

All too frequently authors have followed the line of least resistance, and have named species after the individual (human) who first collected or recognised it. Occasionally there may be some justification for such a course, but descriptive names are generally preferable, and, on the whole, more usual.

In such a system of nomenclature, duplication of names is clearly to be avoided except within a single species, although some specific names may recur in several different genera. The Greeks and Romans did not have separate names for all the different genera that are recognised today, and it becomes increasingly difficult for the expert to find suitable names to define new genera. In addition to the direct use of the appropriate Latin or Greek words such as *Aquila* (Eagle), *Torgos* (Vulture) etc., or the composite descriptive words such as *Erythropygia* (Red-rump) or *Macronyx* (Long-claw), many generic names have been derived from other sources. Some have been compounded from pre-existing genera, giving rise to such names as *Butastur* (*Buteo* + *Astur*) and *Circaëtus* (*Circus* + *Aëtus*) : others bring in a pre-existing name, with a prefix or suffix to denote a certain similarity, hence *Alaemon* (a kind of Lark) : *Pseudalaemon* (false-*Alaemon*), or *Crex* (Corn-crake): *Crecopsis* (*Crake-like*), whilst others again make use of a diminutive (*Calandra* — *Calandrella* : *Psittacus* — *Psittacula*). Many names are descriptive of habits, both real and immaginary (*Campephaga* = Caterpillar-eater : *Caprimulgus* = Goat-sucker), or of habitat (*Actitis* = Shore-dweller : *Schoenicola* = Reed-dweller) : place-names may also be used, in a latinised form (*Balearica, Terekia, Ruwenzorornis,* etc.), and occasionally proper names are employed, for example *Sheppardia, Smithornis* and others.

Perhaps the most interesting names are those derived from the fascinating legends of Greek mythology. Pandion, king of Athens, gives his name to the Osprey, and the name of his daughter Procne, who was transformed into a Swallow, is perpetuated in several Hirundine genera. Pandion's second daughter Philomela (Song-lover), had her tongue cut out by her wicked brother-in-law Tereus, to serve some evil purpose of his own, but the gods made up for it by transforming her into a Nightingale. Halcyon, daughter of the wind-god Aeolus, married Lucifer's son Ceyx, who was subsequently drowned at sea. Awaiting his return on the shore, Halcyon saw his body drifting on the tide, and after appealing to the Gods, both she and her husband's spirit were transformed into Kingfishers and granted immortality.

Most of us acquired, at school, at least a smattering of the classics, and bearing in mind that most scientific names are simple or composite Latin or Greek words with a perfectly ratonal meaning, we begin to realise that they give no cause for alarm, but are, indeed, highly instructive and often entertaining.

The following glossary defines, perhaps somewhat loosely at times, the meaning and derivation of the majority of the composite names commonly found in East African Ornithology. Space does not allow for a complete list, and some names have been deliberately omitted, either because their meaning should be obvious, or because the derivation is obscure, but by breaking up a doubtful name into its component parts and looking them up separately, it should be possible to elucidate it without difficulty. If in doubt about the construction, look up the first three or four letters, and the rest follows. It must be admitted that there are some gaps which can only be attributed to the author's abysmal ignorance of the classics, but it is hoped that these notes may serve to diminish that sense of awe and frustration which the sight of a complicated scientific name so often inspires in us.

Glossary of Scientific names and name-roots.

L=Latin. G=Greek =: a composite name.

a—, an—	G	without
acantha	G	thorn; spine.
Accipiter	L	Hawk.
acer	L	sharp.
acredula	L	kind of bird.
acro—	G	top; summit.
act—	G	shore.
acuta	L	sharp.
aeginthis	G	sparrow.
aeneus	L	brassy.
aeneigularis	=	brazen-throated.
aeruginosus	L	rusty.
aëtho—	G	unusual.
Aëtus	G	Eagle.
afer. afr—	L	african.
affinis	L	related.
agap—	G	love.
agr—	L	field.
alar	L	of the wing.
albi—, albo—	L	white.
albicauda	=	white-tailed.
albiceps	=	,, headed.
albicollis	=	,, necked.
albicrissalis	=	,, bellied.
albifrons	=	,, fronted.
albigularis	=	,, throated.
albirostris	=	,, bellied.
albiventris	=	,, bellied.

albonotatus	=	white-spotted.
Alcedo	L	Kingfisher.
alius	L	another.
alopo—	G	fox
als—	G	woodland.
amaur—	G	dark.
amauroura	=	dark-tailed.
ambi—, amphi—	LG	both.
ambigua	L	doubtful.
amblio—	G	blunt; stupid.
ana—	G	similar to; like..
andro	G	man.
angusti—	L	narrow.
angusticauda	=	slender-tailed.
anomalo—	G	uneven; unusual.
anous	G	stupid.
anthos	G	flower.
apalo—	G	soft.
apatelius	G	illusory.
apis	L	bee.
apiaster	=	bee-eater.
apivorus	=	bee-eating.
apl—	G	simple.
arbor	L	tree.
arcte	L	narrow.
arcticincta	=	narrow-banded.
arcuatus (arqu-)	L	bowed; curved.
Ardea	L	Heron.
ardens	L	burning.
ardesiacus	L	slate-grey.
argaleo—	G	difficult.
argent-atus, —eus	L	silvery.
aridula	L	of the desert.
arizelo—	G	distinct.
armatus	L	armed.
arundinaceus	L	of the reeds.
Astur	L	Hawk.
atimast—	G	neglected.
atri—	L	black.
atricapilla	=	black-haired.
atriceps	=	,, headed.
atrifrons	=	,, fronted.
atrocaerulea	=	black-blue.
aureus	L	golden.
aurantiigula	=	golden-throated.
australis	L	of the south.
axilla	L	arm-pit.

B

badius	L	brown; chestnut.
—baenus	G	climber.
baeo—	G	small.
balaena	L	whale.
balaeniceps	=	whale-headed.
barbat-us, —ula	L	bearded.
—bates	G	dweller.
bathmo—	G	graduated.
bi—, bis	L	twice.
bifasciatus	=	two-banded.
binotata	=	two-spotted.
borealis	L	of the north.
braccae	L	breeches.
brachium	L	arm.
brachy—	=	short tailed.
brachyptera	=	short-winged.
brachyrhynchos	=	,, billed.
brachyurus	=	short-tailed.
brady—	G	slow.
brevis	L	short.
brevirostris	=	short-billed.
brunnei—	L	brown.
brunneiceps	=	brown-headed.
brunneigularis	=	,, throated.
brychus	G	roar; bellow,
bu	G	ox.
bubal	G	buffalo.
Bubo	L	Horned Owl.
bubul	L	of cattle.
buccal	L	of the cheek.
buccina	L	trumpet.
buc(c)inator	L	trumpeter.
Budytes	G	Wagtail.
Buteo	L	Hawk.

C

caeruleus	L	blue; violet.
caesia	L	grey.
cafer	L	of Kafirland.
calam—	G	of reeds.
calandrella	G	dim: of Calandra, Lark,
calva	L	smooth; bare.
campe	G	caterpillar.
campestris	L	of the plains.
campt—	G	shoulder.
cani—	L	grey.
caniceps	=	grey headed.
canicollis	=	,, necked.
cantans	L	singing.
capella	L	goat (bleater).
capillus	L	hair.
capistratus	L	banded.
capra, capri—	L	goat.
caput, capit—	L	head.
carunculata	L	wattled.
casm—	G	open mouth.
castaneus	L	chestnut.

castaneiceps	=	chestnut-headed.
cauda	L	tail.
centr—	G	spine; spur.
cephal-o, —us	G	head.
ceps	L	head.
ceras	G	horn.
cercus	G	tail.
ceria	G	chest.
certhios	G	small-bird.
cervix	L	neck.
cervinus	L	tawny.
Ceryle	G	Kingfisher.
ceuth—	G	hidden.
Ceyx	G	Kingfisher.
chalco—	G	copper; bronze.
chalcomelas	=	bronze-black.
chalcomitra	=	bronze-crowned.
chalcopterus	=	„ winged.
chalcospilos	=	„ spotted.
chalybaeus	G	steel-coloured.
charadr—	L	of cleft; gully.
charit—	G	graceful.
charmosyna	G	agreeable.
cheilos	G	lip.
chel	G	cloven; forked.
chelidon	G	swallow.
Chen	G	Goose.
chlamys	G	cloak; mantle.
chlidon	G	ornament.
chloro—	G	yellow-green.
chlorochlamys	=	green-mantled.
chori—	G	dancing.
chroma	G	colour.
chryso—	G	golden.
cichla	G	kind of thrush.
Ciconia	L	Stork.
cilium	L	eyelid.
cinclos	G	kind of bird; lattice.
cinctus	L	banded.
cinerea	L	grey.
cinereiceps	=	grey-headed.
cinereocapilla	=	„ haired.
cinereola	L	ashy.
cinnamomea	L	cinnamon.
cinnyris	G	small-bird.
Circus	G	Harrier (hawk that flies in circles).
cirrhos	G	tawny; grey.
cirrhocephalus	=	grey-headed.
cist—	G	shrub.
citrin—	L	lemon-yellow.
citriniceps	=	yellow-headed.
clarus	L	clear.
climaco—	G	barred.
climacurus	=	barred-tail.
clypeata	L	shielded.
clyto—	G	glorious.
cneme, (—us)	G	knee.
cocc—	G	grain; berry.
Coccyx	G	Cuckoo.
—cola	G	dweller.
collis	L	neck.
collaris	L	collared.
concinnus	L	neat; pretty.
concolor	L	of one colour.
contra	L	opposite.
conus	G	cone; forehead.
conirostris	=	cone-billed.
Corax	L	Raven; Crow.
corona	L	of the crown.
corruscus	L	wrinkled.
cory-s, —th	G	helmet; crest.
cosm-o, —eto	G	adorned.
cossyphos	G	singing bird.
costa	L	rib.
coxa	L	hip.
craspedo—	G	bordered.
crassi—	G	thick.
crassirostris	=	thick-billed.
creas	G	flesh; wattle.
Crex	G	Crake.
cricos	G	ring.
crinis	L	hair.
crissa—	L	belly; flanks.
crista	L	crest.
croc-atus, —eus	L	saffron-yellow.
cruentus	L	bloody; red.
crumen	L	pouch; bag.
crura	L	legs.
crypto—	G	hidden; secret.
cryptoleuca	=	hidden-white.
cucull-us, —atus	L	hood, hooded.
culmen	L	summit.
cuma	G	wave.
cun— (—ae)	L	cradle.
cupreus	L	copper.
cyano—	G	blue.
cyanocephalus	=	blue-headed.
cyanogenys	=	blue-cheeked.
cyanolaema	=	blue-throated.
cyanoleuca	=	blue-white.
cyanostictus	=	blue-spotted.
cypselos	G	martin; swift.

D

dactyla	G	toe.
dasy—	G	hairy.
decipiens	L	deceptive.
dendro—	G	tree.
dens, dentate	L	tooth; toothed.
derma	G	skin.

di—	G	twice.
diaphor—	G	different.
dicro—	G	forked.
dilutior	L	weak.
dimidiatus	L	half; halved.
dioptr—	G	scout.
diplo—	G	double.
dipn—	G	food.
diss	G	double.
dont	G	tooth.
dorsal	L	of the back.
dorsostriatus	=	stripe-backed.
drepano—	G	sickle-shaped.
drepanorhynchus	=	sickle-billed.
drymo—	G	forest.
dryo—	G	tree.
dusa	G	of the sunset.

E

e—, ex—	L	without; lacking.
ecaudatus	=	tail-less.
ecto—	G	outside.
edulis	L	edible.
elachior	G	small.
Elanus	G	Kite.
elos	G	marsh frequenter.
Emberiza	L	Bunting.
empid	G	gnat.
endo— ento—	G	within.
—ensis	L	from (place).
ephippio—	G	saddle.
epi—	G	upon.
eranos	G	lovely.
eremo—	G	solitary; gentle.
erisma	G	prop.
erithacus	G	solitary.
Erodios	G	Heron.
erythros	G	red.
erythrocephalus	=	red-headed.
erythroceria	=	„ chested.
erythrogaster	=	„ bellied.
erythrophthalma	=	„ eyed.
erythrops	=	„ faced.
erythropygia	=	„ rumped.
erythrorhyncha	=	„ billed.
—estes	L	eater.
eu—	G	straight; true.
euro—, eurys	G	wide; eastern.
euricricotis	=	wide-ringed.
eurocephalus	=	wide-headed.
excubitor	L	sentinel.
eximia	L	distinguished.
exustus	L	of the desert.

F

falcin-ellus	L	sickle (dimin).
famosa	L	renowned.
fascia (—tus)	L	band, banded.
fasciinucha	=	banded-nape.
fasciiventer	=	banded-belly.
ficus	L	fig (tree).
flammulatus	L	flame-coloured.
flava	L	yellow.
flavicrissalis	=	yellow-flanked.
flavigaster	=	„ bellied.
flavigula	=	„ throated.
flavilateralis	=	„ flanked.
flavirostris	=	„ billed.
flavitarsus	=	„ legged.
flaviventris	=	„ bellied.
flavivertex	=	yellow-crowned.
flavocincta	=	„ banded.
flavotorquata	=	„ collared.
fluviatilis	L	of the river.
fren-atus, —um	L	bridled.
fringilla	L	finch.
frons	L	forehead.
fulg-ens, —idus	L	shining.
Fulica	L	Coot.
fuliginosa	L	sooty.
fulva	L	yellow-brown.
fulvopectoralis	=	fulvous-breasted.
funebrea	L	dusky; dark.
fuscus	L	dark.
fusconota	=	dark-backed.

G

galactos	G	of milk.
gal-eo, —er—	L	helmeted; crested.
gaster	G	stomach; belly.
gelo—	G	laughing.
gena	L	cheek.
genys	G	jaw; cheek.
geo—	G	of the earth.
geranus	G	crane.
gibber	L	hump.
glareola	L	of gravel.
gluteal	G	of the buttocks.
gnathos	G	jaw.
gracilis	L	slender.
gracilirostris	=	slender-billed.
graculus	L	jackdaw.
griseus	L	grey.

griseigula	=	grey-throated.
griseopygia	=	,, rumped.
gular	L	of the throat.
gutt-ata, —era	L	speckled.
gymno—	G	bare; naked.
gymnobucco	=	bare-cheeked.
gymnogenys	=	,, cheeked.
Gyps	G	Vulture.

H

haema	G	blood; red.
haematocephala	=	red-headed.
hal—	G	of the sea.
hamatus	L	hooked.
haplo—	G	simple.
harp—	G	sickle; Kite.
hedy	G	sweet.
helios	G	sun.
helo—	G	marsh-frequenter.
hemi—	G	half.
Herodios	G	Heron.
hetero—	G	different.
hiat—	L	cleft.
hieros	G	sacred.
hierax	G	falcon; hawk.
himant—	G	leather strap.
hippolais	L	singing-bird.
hirsutus	L	hairy.
hispid	L	bristly.
holo—	G	whole.
homo—	G	similar.
hoplon	G	weapon.
horus	L	sun (Anc. Egypt).
humeral	L	of the shoulder.
hydro—	G	water.
hyla	G	wood; copse.
hyper—	G	above.
hyphantes	G	weaver.
hypo—	G	underneath.
hypochlora	=	yellow-underparts.
hypostictus	=	spotted ,,
hypoxanthus	=	yellow ,,

I

ianthinus	L	violet.
ianthinogaster	=	violet-bellied.
icter	G	yellow; (Oriole).
Ictinos	G	Kite.
igneus	L	fiery.
igneiventris	=	fiery-bellied.
ilio—	L	of the flanks.
illas, illad—	G	kind of thrush
imberbis	L	beardless.
indicator	L	guide.
infulatus	L	banded.
infuscatus	L	dark-coloured.
ingens	L	large.
insignis	L	marked.
intercedens	L	coming between.
interpres	L	go-between.
iolaema	G	rusty-throated.
irrisor	L	mocker; mimic.
irroratus	L	mottled.
isabeline		greyish-yellow.
—ius	G	of; dweller.
ixos	G	berry; reed.

J

juncus	L	of rushes.
Jynx	G	Wryneck.

L

labium	L	lip.
laema	G	throat.
laetus	L	joyful.
lais	G	kind of thrush.
lamella	L	small plate.
lampr—	G	shining.
lanius	L	butcher.
lateralis	L	of the flanks.
lati—, —us	L	broad.
latifrons	=	broad-fronted.
latistriatus	=	,, striped.
lepid-a, —us	L	neat.
lepido—	G	scaly.
lepto—	G	slender.
lestes	G	robber.
leuco—	G	white.
leucogaster	=	white-bellied.
leucolophus	=	,, crested.
leucomela	=	white & black.
leucomystax	=	,, moustached.
leuconotus	=	,, backed.
leucoparaeus	=	,, cheeked.
leucophrys	=	,, browed.
leucoptera	=	,, winged.
leucopygia	=	,, rumped.
leucorhynchus	=	,, billed.
leucotis	=	,, eared.
limno—	G	of marsh or pond.
linea	L	line.
lingua	L	tongue.

lio—, liss—	G	smooth.
lithos	G	stone.
littoralis	L	of the shore.
longipennis	=	long-winged.
longirostris	=	,, billed.
lopho—	G	crested.
lucidus	L	bright.
lucidipectus	=	bright-breasted.
lugens	L	in mourning.
lugubris	L	mournful; dark.
Luscinia	L	Nightingale.
luteus	L	orange-yellow.

M

machaer	G	dagger.
machus	G	battle.
macro—	G	large; long.
macroceras	=	large-horned.
macroura	=	long-tailed.
maculata	L	spotted.
maculicollis	=	spotted-neck.
malaco—	G	soft.
malaconotus	=	soft-backed.
marginatus	L	of the shore.
mega—	G	large; long.
megarhyncha	=	large-billed.
melas	G	black.
melamprosopus	=	black-masked.
melanocephala	=	,, headed.
melanogaster	=	,, bellied.
melanoleucus	=	black & white.
melanonota	=	black-backed.
melanops	=	black-faced.
melanoptera	=	,, winged.
melanorhynchus	=	,, billed.
melanota	=	,, eared.
melanoxanthus	=	black & yellow.
melis	L	honey.
meliphilus	=	honey-lover.
melitta	G	bee.
melittophagus	=	bee eater.
melos	G	song.
melocichla	=	singing-thrush.
mentalis	L	of the chin.
Merops	L	Bee-eater.
meso—	G	medium.
micro—	G	small.
microrhynchus	=	small-billed.
Milvus	L	Kite.
minusculus	L	little.
mitra	G	head-dress; crown.
monach-a, —us	G	solitary.
mono—	L	alone; one.
montana	L	of the mountains.
morpha	G	shape; form.
Motacilla	L	Wagtail.
mulg-us	L	milk; suck.
multi—	G	many.
musc-a, —i—	L	fly.
muso	L	banana.
myct—	G	fungus.
myi (—as)	G	fly.
myrmecos	G	of ants.
mystax	G	moustache.

N

naias	G	water-nymph.
nanus	L	dwarf.
—nastes	G	occupant.
nasutus	L	long-nosed.
nautes	G	sailor.
necros	G	corpse.
nectar	L	honey.
nema	G	thread.
neo—	G	new.
neso—	G	islander.
netta	G	duck.
niger, nigri—	L	black.
nigricauda	=	black-tailed.
nigriceps	=	,, headed.
nigricollis	=	black-necked.
nigrifrons	=	,, fronted.
nigripennis	=	,, winged.
nigriscapularis	=	,, shouldered.
nigrodorsalis	=	,, backed.
nigrotemporalis	=	,, templed.
nigroventris	=	,, bellied.
nitens	L	coloured.
nitidus	L	shinning.
nivea	L	snow.
notatus	L	spotted.
notum	L	back.
nuchal	L	of the nape.
nycti—	L	of the night.

O

occiput	L	back of head.
ochro—	G	yellow.
Ocnos	G	Bittern.
ocular	L	of the eye.
—odius	G	of; by the way.
—odont	G	tooth.
oecetor	G	inhabitant.
oedos	G	swollen.
Oena	G	Dove.
Oenanthe	G	Wheatear.

onax	G	king.
onych	G	claw.
ophthalma	G	of the eye.
ops	G	eye; face.
—opsis, —opius	G	appearance; —like.
orbito—	L	of the eye.
oreo	G	mountain.
orestes	G	mountaineer.
ornis	G	bird.
orthos	G	straight.
Ortyx (ortygo--)	G	Quail.
ostrinus	L	purple.
otis, otus	L	ear.
Otis	G	Bustard.
Otus	L	Horned Owl.
ourus	G	tail.
oxy—	G	sharp.

P

pachy—	G	thick; fat.
pachyrhyncha	=	thick-billed.
pada	G	tree.
paludis	L	marsh.
paludicola	=	marsh-dweller.
palustris	L	marsh.
pan—, pam—	G	all.
pammelaina	=	all black.
para	G	besides.
par-aeus, —eia	G	cheek.
parra	L	bird of ill-omen.
Parus	L	Tit.
parva	L	small.
pastor	L	herdsman.
pecten	L	comb.
pectus	L	chest.
pecuarius	L	grazing.
ped	L	foot.
pedilo—	G	sandal.
peli	G	black.
Pelia	G	Dove.
peltata	L	with a shield.
pennis	L	wing.
penth—	G	sorrow.
percnos	G	dark.
percnopterus	=	dark-winged.
periss—	G	uneven.
permista	L	mixed.
personata	L	marked.
perspicillata	L	conspicuous.
petrosus	L	of stones.
phaeo—	G	dark.
phaga, (—us)	G	eater.
phalacro—	G	bald.
philo—	G	loving.
phoenico—	G	crimson; purple.
pholi—	G	scaly.
phoneus	G	murderer.
—phonus	G	voice.
phorm—	G	woven basket.
—phorus	G	bearer.
Phoyx	G	kind of Heron.
—phrys	G	of the brow.
phylla	G	green; leafy.
phyto—	G	of plants.
picta	L	painted.
pictipennis	=	painted-wing.
pileata	L	capped.
pinar	G	dirty.
pirum	L	pear.
platalea	L	spoon.
platy—	G	flat.
plectes	G	plaiter; twister.
plectron	G	spur.
plegadis	G	sickle.
pleura	G	flanks.
ploceus	G	plaiter; weaver.
plumbeum	L	grey.
pod	G	foot.
podex, podic—	L	rump.
poecilo—	G	mottled.
poecilolaemus	=	mottled-throat.
poecilosterna	=	„ breast.
pogon	G	beard.
polem	G	war-like.
polio—	G	grey.
poliocephalus	=	grey-headed.
poliolopha	=	„ crested.
poliophrys	=	„ browed.
poliopleura	=	„ flanked.
polioptera	=	„ winged.
poliothorax	=	„ breasted.
pomast	G	lid; cover.
porphyreo—	G	purple; russet.
porphyreolaema	=	purple-throated.
prasina	L	green.
prion	G	jagged.
Procne, Progne	G	Swallow.
proct—	G	of the hind-parts.
prosopus	G	face-mask.
psalido—	G	shears.
Psar (psarus)	G	Starling.
pseudo—	G	false.
Psittacus	G	Parrot.
pternistes	G	one who strikes with the heel.
pter-on, —yx	G	wing; feather.
ptilos	G	feather; wing.
ptyon	G	fan.
pulchra	L	beautiful.
pumilus	L	dwarf.
punctata	L	spotted.

purpureus	L	purple.
purpureiceps	=	purple-headed.
purpureiventris	=	,, bellied.
purpuropterus	=	,, winged.
pus	G	foot.
pusillus	L	small.
pycnos	G	strong.
pygargus	G	white-rumped.
pygia	G	rump; tail.
pyren	G	fruit-stone.
pyrrho—	G	bronzy; reddish.
pyrrhopterus	=	bronze-winged.

Q

quad—	L	four.
quadrivirgatus	=	four-striped.

R

rallus	L	Rail; thin.
recurv—	L	bent back or up.
rhamph-us	G	beak.
rhino—	G	nose; rasp.
rhipis	G	fan.
—rhis	G	nose.
rhodo—	G	rosy.
rhodogaster	=	rosy-bellied.
rhodopareia	=	,, cheeked.
rhodophoneus	=	,, murderer.
rhynchos	G	beak.
riparia	L	frequenter of stream-banks.
roseus	L	rosy.
roseicrissa	=	rosy-flanked.
rostrum	L	beak.
ruber	L	red.
rubiginosa	L	rusty-red.
rubrifascies	L	red-faced.
rudis	L	wild.
rufi—, rufo—	L	red.
ruficapilla	=	red-haired.
ruficollis	=	,, necked.
rufidorsalis	=	,, backed.
rufigula	=	,, throated.
rufinuchalis	=	,, naped.
rufipennis	=	,, winged.
rufiventris	=	,, bellied.
rufobuccalis	=	red-cheeked.
rufocinctus	=	,, banded.
rufocinerea	=	red & grey.
rufocinnamomeus	=	red & cinnamon.
rufogularis	=	red-throated.
rupestris	L	of rocks.

S

sagitta	L	arrow.
salp-inctes	G	trumpeter.
sarki—	G	flesh; wattle.
sarothron	G	broom.
saxa, (saxatilis)	L	rock; of rocks.
scapularis	L	of the shoulders.
schistaceus	G	slaty.
schizo—	G	cloven; forked.
schoeno—	G	of reeds.
scirpaceus	L	of reeds.
sclero—	G	hard.
scopt—	G	mimic.
scopus	G	watchman.
scoto—	G	dark.
scute	L	shield.
sei—	G	shake.
seicercus	=	tail-shaker.
semi—	L	half.
semirufa	=	half-red.
semitorquata	=	half-collared.
sibilatrix	L	whistler.
silvanus	L	of the trees.
soma	G	body.
sparsus	L	scattered.
sparsimfasciatus	=	sparse-banded.
speciosa	L	handsome.
speculum	L	mirror.
sperm	G	seed.
spheno—	G	wedge; bill.
sphenurus	=	wedge-tailed.
spilo—	G	spotted.
spilogaster	=	spotted-belly.
spiza	G	finch.
splendens	L	shining.
spora	G	seed.
squamatus	L	scaly.
Squatarola	L	Black-bellied Plover.
stagnatilis	G	of pools.
stegano—	G	covered; webbed.
steira	G	keel; wattle.
stelgid—	G	scraper.
stella	L	star.
steno—	G	narrow.
stephano—	G	of the crown.
stephanophorus	=	crown-bearer.
sternum	G	chest.
stictus	G	spotted.
stictilaema	=	spotted-throat.
stigmato—	G	spotted.
stigmatophorus	=	spot-bearer.
stigmatothorax	=	spotted chest.

stilbo—	G	shining.
stiphros	G	sturdy.
stoma	G	mouth.
strephus	G	twister.
strepitans	L	noisey.
strepto—	G	pliant.
striatus	L	striped.
striatipectus	=	stripe-breasted.
striolatus	L	striped.
Strix	G	Owl.
Struthio	L	Ostrich.
sub—	L	under; below.
sulphuratus	L	sulphur-yellow.
supercilium	L	eyebrow.
sycobius	G	of fig-trees.
sylvia	L	of the woods.

T

tachy—	G	swift.
taenia	G	band.
taeniolaema	=	banded-throat.
tarsus	G	leg; foot.
tegmen	L	cover.
tel—	G	at the end.
tenellus	L	tender.
tenui—	L	slender.
tenuirostris	=	slender-billed.
tephro—	G	ashy-grey.
tephrolaema	=	grey-throated.
tergum	L	back.
testa	L	shell.
thalassa	G	sea.
thamno—	G	of shrubs.
theio—	G	run.
—thera	G	hunter.
thorax	G	chest.
—threptes	G	nourished.
threski—	G	sacred.
thrix	G	hair.
thylax	G	bag; pouch.
tigr—	G	striped.
tinniens	L	tinkling.
tmet—	G	dividing.
Torgos	G	Vulture.
torquata	L	collared.
trachelos	G	neck.
trachy—	G	rough.
tri—	L	three.
tricho—	G	hairy.
tricollaris	=	three-collared.
tricolor	=	„ coloured.
trigon	G	triangle.
Tringa	G	Sandpiper.
tristigma	=	three-spotted.
tristriata	=	„ striped.
trocho—	G	wheel; round.
troglodytes	G	cave-dwellers.
trogon	G	gnawer.
Turnix	L	Quail.
tympanum	L	drum.
Tyto	G	Owl.

U

undosus	L	wavy.
uni—	L	one.
unicincta	=	one-banded.
unicolor	=	one-coloured.
Upupa	L	Hoopoe.
—urus	G	tail.

V

venter	L	belly.
venustus	L	pretty.
vermis	L	worm.
vermiculate	=	fine wavy lines.
vertex	L	crown.
verticalis	L	of the crown.
versicolor	L	parti-coloured.
vidua	L	widowed.
vinaceus	L	wine-like.
vinaceigularis	=	purple-throated.
virens	L	green.
virgatus	L	striped.
viridis	L	green.
viridisplendens	=	shining-green.
vitelline	L	yolk-like; yellow.
vittatus	L	banded.
—vorus	L	eater.

X

xanthos	G	yellow.
xantholophus	=	yellow-crested.
xanthomelas	=	yellow & black.
xanthophilus	=	yellow-loving.

Z

zona	G	band.	zoster	G	band; girdle.
zonurus	=	banded-tail.	zosterops	=	banded-eye.

References.

Henderson, I.F. & W.D. 1949.
A Dictionary of Scientific Terms. 4th Edition, by Kenneth, J.H.

Jaeger, E.C. 1950.
A Source-Book of Biological Names and Terms. 2nd Edition.

NOTES ON THE ALOES OF SOUTHERN ETHIOPIA AND SOMALIA.

BY DR. G. W. REYNOLDS.

The Coryndon Museum Expedition to Southern Ethiopia and Somalia was organised to facilitate the investigation of *Euphorbia, Monadenium*, succulents, and general botanical collecting by Mr. P. R. O. Bally, and for the investigation and study of the genus *Aloe* by myself. Mr. A. Money-Kyrle accompanied us on Quelea and other research.

The species of *Aloe* recorded from Southern Ethiopia and Somalia had been imperfectly described, type material was scanty and incomplete, and there were no figures. Until I could visit type localities and study plants on the spot, I had little hope of ever being able to recognise or identify those species. My special interest therefore, was to visit those type localities, try and establish identities, write up full descriptions, secure photographs, and prepare herbarium material. In a short article such as this, notes must of necessity be very brief and sketchy, but descriptions of new species and full notes on identities, etc., with photographs, will appear in a forthcoming issue of the *Journal of South African Botany.*

The first part of our travels took us northwards to Isiolo, thence to Wajir and Moyale on the Ethiopian border. The termitaria north of Wajir were impressive, some of them being 6-9 feet broad at the base, and reaching 15 feet in height. (Fig. 1).

In Ethiopia we visited Mega and Yavello, while I went alone up to Agere Mariam. It was a surprise to find that *Aloe secundiflora* Engler (plentiful near the Athi River road bridge, 23 miles S.E. of Nairobi—where plants flower in April-May) occurred in numbers near Moyale and repeatedly along the road to Mega and up to Yavello, west of Yavello, but not seen east of Yavello on the road to the Daua Parma River (Fig. 2).

A distinctive new species with deeply channelled much recurved leaves, a paniculate inflorescence with dense racemes of clavate orange flowers was found in considerable quantities on arid plains 48 miles N.W. of Moyale (Fig. 3) and also north of Mega and Yavello. It was also noticed 14 miles south of Buna in Kenya. Many Aloes, found in full flower at Mega turned out to be *A. Rivae* Bak. (Fig. 4). This species also extends northwards to Yavello and beyond. *A. boranensis* Cufod. had been described from "near Dubuluch, coming from Yavello", but certain plants found in that region, (about 26 miles north of Mega), which fitted the description, turned out to be crosses between *A. secundiflora* and what I believe is *A. otallensis* var. *elongata.*

Yavello proved a most interesting place. Another new species of Aloe was found there, a shrub, related to the East African shrubby Aloes, but

Fig. 1. *Termite mound, north of Wajir, Northern Province, Kenya.*

Fig. 2. *Aloe secundiflora Engler* 16 *miles N.W. of Moyale, Borana, S. Ethiopia.*

Fig. 3. *Aloe new sp. 48 miles N.W. of Moyale, Borana, S. Ethiopia.*

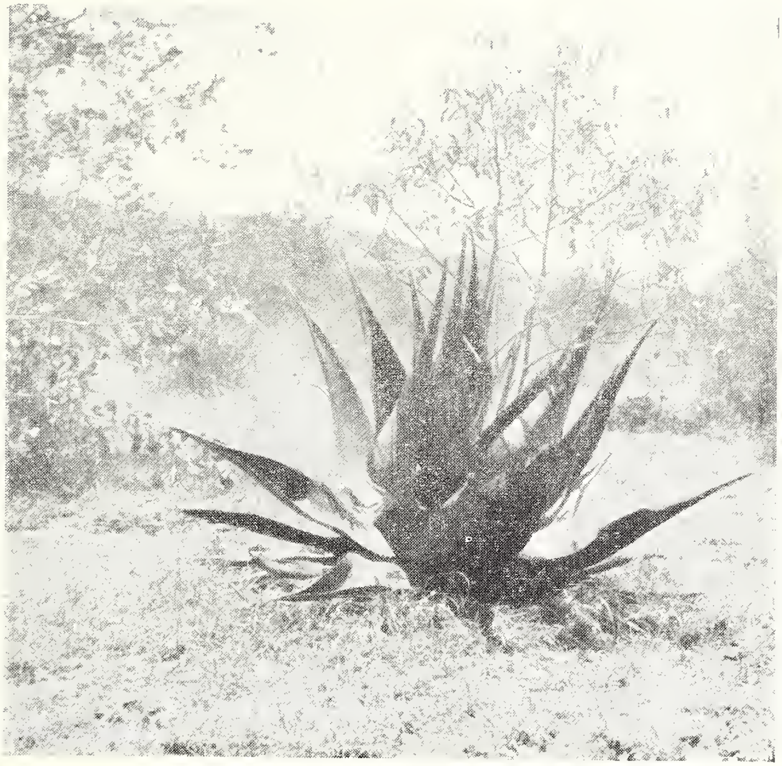


Fig. 4. *Aloe Rivae Bak. flowering at Mega, Borana, S. Ethiopia.*

Fig. 5. *Termite chimney at Yavello, Borana, S. Ethiopia.*

Fig. 6. *Aloe microdonta Chiov.* 20 *miles S. of Bulo Burti, Somalia.*

differing from them all in having copper-brown leaves, cylindric spotted flowers only 27mm. long, with 10mm. pedicels.

At Yavello Mr. Money-Kyrle secured about ten specimens of the rare bird *Zavattariornis stresemanni*, a species of crow, black, grey and white in plumage with leaden-blue bare skin around the eyes. Mr. John Williams tells me this rare bird is known only from the Yavello district and provides the link between the crows and the starlings.

Yavello is also famous for its great turritiform termitaria, reported to occur only in that region. I photographed one slender lofty specimen which was over 25 feet high (Fig. 5).

The Ethiopian Orthodox Church in Yavello is a small circular building surrounded by a stockade of poles. The sloping roof is crowned with a horse-shoe shaped arrangement of wire threaded through eight or ten ostrich-egg shells, each shell being about one foot apart. One Ethiopian told me that the egg shells were merely ornaments; another said they were placed there to keep the devil away.

From Yavello the road leads eastwards, sloping gently down to the Daua Parma River, then it climbs up to Neghelli. Mr. Bally was overjoyed at finding a *Monadenium*, which might be *M. majus* described from Harar. Masses of plants were found, in full bloom, for 20 to 30 miles south of Neghelli, in country where no Aloe was found. From Neghelli south-eastwards to Dolo is not Aloe country, but Mr. Bally found much in the way of *Euphorbia* to interest him.

Near the Ganale Doria River in Ethiopia we ran across some baboons, the like of which I had never seen or heard of before. They had long shaggy hair around the shoulders, while the lower half of the body and hindquarters was flesh-coloured and devoid of hair. I don't know their name, but a good vernacular name for them would be the "Fur-cape baboon." (Probably Hamadryas—B.V.)

From Dolo we followed the road southwards to Lugh Ferrandi, thence to Iscia Baidoa where large quantities of the most attractive *Adenium somalense* were in full bloom. Some plants were 8-10 feet high, their clusters of brilliant deep red flowers decorating and enlivening an otherwise drab landscape.

Bardera, on the Juba River, was reached, and we headed southwards for Gelib and Margherita. This was an important area for me since it contained a few Aloe type localities. *A. microdonta* Chiov. was recognised at last. It is distinguished by having deeply channelled much recurved leaves, with a paniculate inflorescence with oblique to almost horizontal branches of laxly flowered racemes with secund red flowers. *A. Ruspoliana* Bak. (type locality Mil Mil in the Ogaden) was also found in numbers and it eventually transpired that this species and *A. Jex-Blakeae* from the Horr Valley, Kenya, are conspecific.

A. Stefaninii Chiov. is merely a form of *A. Ruspoliana,* while *A. defalcata* Chiov. proved to be a mixture of species, the channelled recurved leaves of *A. microdonta* having been mixed with the capitate yellow-flowered racemes of *A. Ruspoliana.*

A. Pirottae Berger was found in several localities and so was *A. trichosantha* Berger var. *albo-picta* Schweinf.

A. Ellenbeckii Berger, described from along the Juba River south of Baidera, and as having flowers allied to those of the East African species *A. lateritia,* in the Section *Saponariae,* was not found anywhere. From what I have seen of the vegetation of the Juba River I doubt very much whether any *Aloe sp.* allied to *A. lateritia,* is to be found in those regions.

The tree, *Euphorbia Robecchi,* is common in parts of the coastal area, and is used at the saw mill near Kismayu for making slats for crating bananas for export to Italy.

Queleas are also giving the Italian agronomists much trouble in the irrigated lands along the Juba River near Gelib and Margherita, so much so that cereals can no longer be grown. One Italian told us that in 1946 he had 1,000 acres under rice. Then the Queleas came in flocks of millions, darkening the sun, and wiped out his entire crop in two days. He fired his shot-gun into the air, and with that one shot brought down no less than 634 birds. It is now clear that unless some scheme of Pan-African control is organised, and that soon, on lines similar to those of the Desert Locust Control, nothing less than a major disaster will overtake Africa's cereal cultivation, to say nothing of some of the grasses.

From Kismayu we journeyed up to Mogadishu, finding numbers of *A. microdonta,* and lesser quantities of *A. Ruspoliana* on the way. *Caralluma somalica,* with its dense heads of yellow flowers, was seen near Merca, not far from the sea.

We had hoped to press on to Hargeisa in Somaliland Protectorate, but got no further than Bulo Burti, 135 miles north of Mogadishu. Here, with broken springs, the rains imminent, and threatened with the real danger of being bogged down and cut off, we reluctantly decided to follow the dictates of wisdom, and turn back.

Returning to Kismayu and travelling via Beles Cogani and Liboi, we reached Garissa and Nairobi only one day before the rains came, and the closing of some coastal roads.

Our expedition had covered 3,750 miles, and I returned to Johannesburg, filled with gratitude that my investigations had been blessed with every success.

I am indebted to the South African Council for Scientific and Industrial Research, for a travelling grant which made possible my Aloe investigations in Ethiopia and Somalia.

TREE-EUPHORBIAS AS TIMBER TREES

By P. R. O. Bally.

Tree-Euphorbias or "Candelabrum Trees" which are so characteristic of the tropical African scenery are generally considered to be of no economic value.

It is true that native tribes have a number of uses for them.

The dried branches were used for carrying fire, for, once set alight, they continue to smoulder for many hours. The Kikuyu use the pith of the candelabrum tree as a roborant and fattening cure for old men.

The latex of many of them, diluted in water, serves for a purge for cattle and man, but it is not without danger, for it is used also in the preparation of arrow poison and for killing fish.

In parts of Central Tanganyika, the straight, light stems of a tree Euphorbia make rafters for native huts.

The outer portions of the branches of *Euphorbia* contain large quantities of latex contained in long, branched latex tubes which are distributed all over the plant. The latex contains starch grains, amorphous resin, mucilage, mineral salts, a virulous resinous substance called euphorbon, and rubber.

The dried latex of certain species has for centuries been used as an energetic rubeficient or blister, but nowadays its use is restricted to veterinary practice.

During World War II, when, with the Japanese invasion of the Far East, plantation rubber had become scarce, the latex of many South and Tropical African tree-Euphorbias was analysed for its rubber content, as a possible substitute, but none of them contained rubber in sufficient quantities, besides there were technical difficulties in separating the rubber from the other constituents of the latex.

There are, however, two species of tree-Euphorbias which are of considerable economic importance: in Eritrea, a country much eroded and with very poor rainfall, there occurs *Euphorbia abyssinica* (Fig. 1) in vast numbers. It grows to a height of 40 ft. and more, with a clean bole of considerable length and diameter. The Italians soon found that the wood with its soft, parallel fibre is particularly well suited for the manufacture of matches. When dry, it burns easily and evenly. A large factory in Asmara produces matches not only for local consumption, but also for export. The boxes, too, are made from the same timber (fig. 2).

From the shavings, sawdust and other waste which are pulped and treated in a special plant, a strong brown paper is made.

Unfortunately the growth of *E. abyssinica* is very slow indeed, nor has any effort been made to regenerate the cut-out stands of the tree, and it is only a matter of time before supplies of this timber will be exhausted.

In the coastal regions of Somalia — semi-desert country except along the Juba River and along the Webi Shebelli, — the tall *Euphorbia robecchii* Pax (Fig. 3) abounds and dominates the otherwise stunted xerophytic tree growth. From its soft, odourless timber, the crates for shipping the bananas from huge plantations run by the Italians along the banks of the two rivers, are made.

E. robecchi has a particularly acrid and obnoxious latex which — even in the minutest quantities — causes virulent inflammation of the mucous membranes and a drop of which raises blisters on the skin.

Before the tree is cut, a fire is built around the base which scorches the bark and destroys the latex. The trees are then felled, the branches chopped off and left behind to be used for singing the latex of other trees.

The logs are then taken by lorry to the sawmill in Chisimaio (Fig. 4) whence the bananas are shipped to Italy, cut up into slats and made into frames for the crates (Fig. 5). The wood has to be used green, when it is tough and resilient. Once dry, it becomes brittle and looses most of its strength, so that the crates can be used for one single voyage only.

Already, the timber has to travel many miles to the factory, the neighbourhood having been thoroughly cut out, but *E. robecchi* is exceedingly common over a great portion of British and Italian Somaliland, in the Northern Frontier Province of Kenya, it extends South into the Tsavo National Park and further South into Northern Tanganyika where the most Southernly limit seems to be near Mkomasi.

Peter R. O. Bally,
Botanist,
Coryndon Museum, Nov. 1953.
Photographs by the author.

EXPLANATION OF FIGURES.

(1) *Euphorbia abyssinica* Gmel. n'r Nefasit, Eritrea.
(2) *Euphorbia robecchii* Pax n'r Maungu, Tsavo National Park.
(3) logs of *E. robecchii* at the sawmill in Chisimaio.
(4) frames for banana crates, stacked at the sawmill, Chisimaio.

OBITUARY

AIR-VICE MARSHALL SIR ROBERT BROOKE-POPHAM

The Society is grieved to hear of the death of Sir Robert Brooke-Popham, G.C.V.O., K.C.B., C.M.G., D.S.O., A.F.C. During Sir Robert's stay in Kenya as Governor he was a Patron of the Society. Although war broke out during his stay in the Colony with all its complications and anxiety, Sir Robert was interested in the affairs and well-being of the Society.

H. Copley.

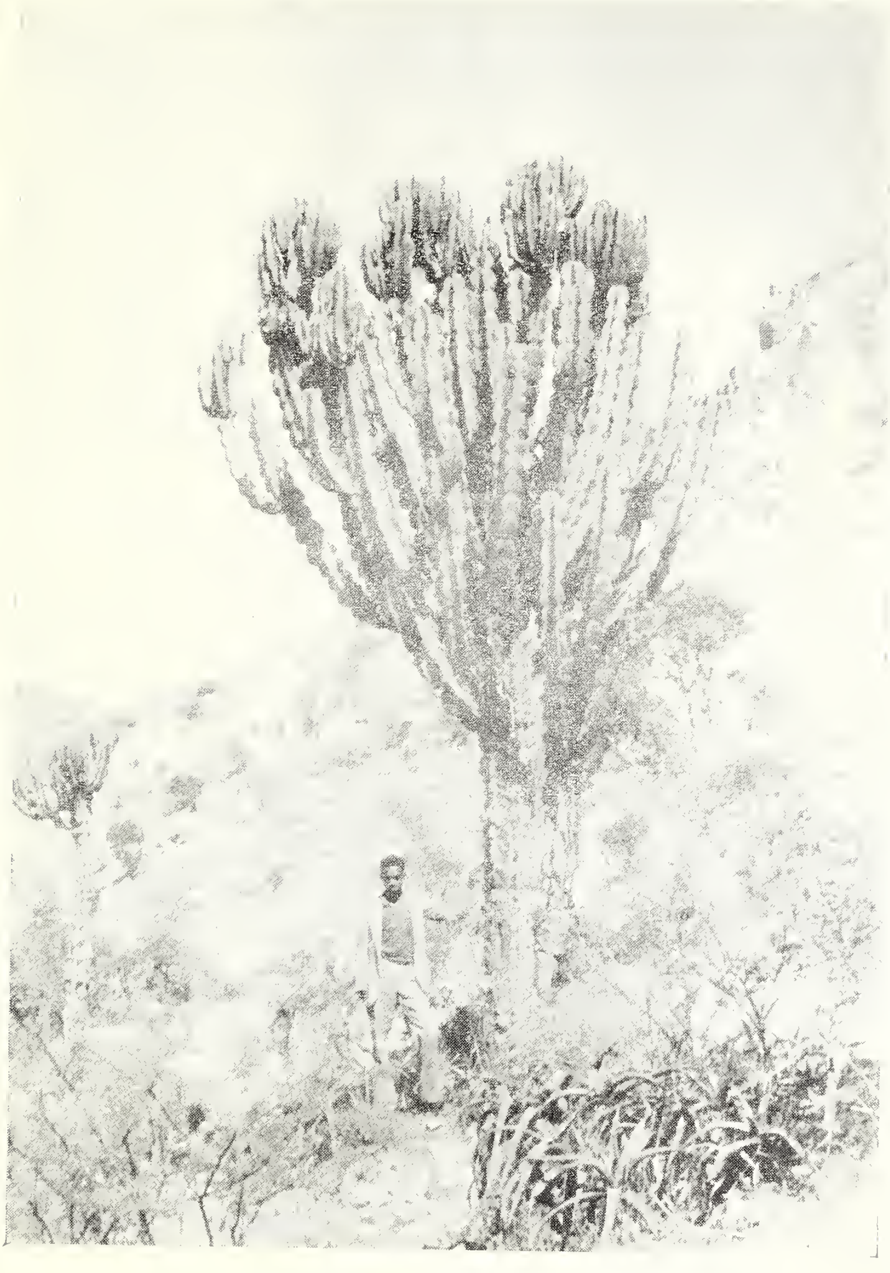


Fig. 1. *Euphorbia abyssinica Gmel.*

Fig. 2. *Euphorbia robecchii Pax*

Fig. 3. *Making match boxes from Euphorbia timber in Asmara.*

Fig. 4. *Logs of Euphorbia robecchii at Chisimaio Sawmill.*

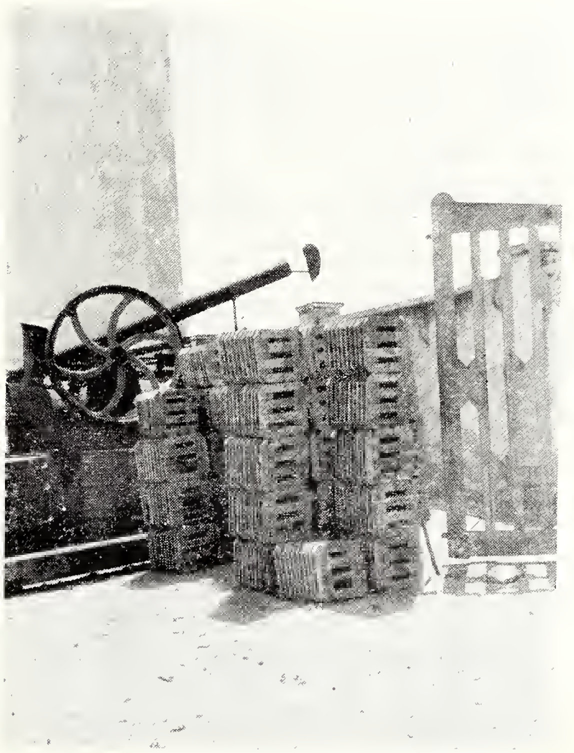


Fig. 5. *Crate-frames made from Euphorbia robecchii.*

THE IDENTIFICATION OF THE SPOOR AND DUNG OF EAST AFRICAN MAMMALS.

By Dr. P. R. Hesse

PART I. THE ANTELOPES

Introduction

As the primary function of these articles is to illustrate the tracks and droppings of the more common mammals found in East Africa, only the briefest of notes on the animals will be given. They are designed to indicate the type of country in which to expect the tracks shown and whenever possible definite localities have been named. Neither the spoor nor the dung of every East African mammal has yet been encountered by the author and so the series of articles is by no means comprehensive.

It must be remembered that although the spoor as illustrated shows the complete imprint of the foot, in practice a perfect track is seldom found. Moreover, the following points should be borne in mind when attempting to identify spoor :—

i. The hooves of antelope tend to splay out when the animal is running. In these cases the marks of the hoof tips will be much deeper than usual and the rounded, back portion may not show at all.

ii. The young animals of a large species often make tracks similar to those of mature animals of a smaller species. If such is the case however, the similar, but larger footprints of the adult female will almost certainly be found at the same time.

iii. In many cases the imprint of the hind foot is slightly different to that of the forefoot.

The dung of antelopes is frequently found not as separate pellets but as a compressed mass. Normally however, the characteristic shape of the pellets can still be seen. When young animals are present their smaller dung can cause the same confusion as their smaller spoor, until one comes across the larger droppings of the adult.

Dikdik *Rhynchotragus kirkii* (Kiswahili: dikidiki, suguya)

There are four races of dikdik found in East Africa generally distributed in bush and dry country. As they have a habit of returning to the same place to deposit their droppings, the dung is found as heaps of small, black pellets. The spoor can easily be confused with that of the Blue Duiker.

Steinbok *Raphicerus campestris* (Kiswahili: paa, dondoro)

These are of general distribution and are found in grassland or bush where they occur singly or in pairs. The dung is similar in appearance to that of a dikdik but rather smaller.

Klipspringer *Oreotragus oreotragus* (Kiswahili: mbuzi mawe, ngurunguru)

This antelope is found in mountainous and rocky country and consequently the spoor is but rarely seen, particularly as normally only the tips of the hooves touch the ground. It differs from that of the other small antelope by having broad, rounded tips. The klipspringer has been recorded from the Ngong Hills, Kedong Hills, the Naivasha area, Kilimanjaro, the Pare Hills, Moshi, Arusha, Tabora, Dodoma, Mbeya, Kigoma, Iringa, Mwanza and Musoma.

Common Duiker *Cephalophus grimmia* (Kiswahili: paa, nsya)

Generally distributed and found singly or in pairs, this duiker inhabits tall grassland, thin forest and bushland. Like the dikdik it returns to the same place to deposit its droppings which are very like those of the dikdik although without the pronounced "pear-shape" of the latter.

Blue Duiker *Cephalophus monticola* (Kiswahili: paa)

The Blue Duiker is found singly or in pairs in forest and thick bush. Once again the droppings are found in localised heaps.

Red Duiker *Cephalophus harveyi* (Kiswahili: funo)

This duiker is found in the bushland and forests of high localities such as the Aberdares, Usambaras and Kilimanjaro. Its spoor is much larger than that of the preceding duikers although of the same shape. Its dung similarly is much larger.

Yellow-backed Duiker *Cephalophus sylvicultor* (Kiswahili: paa)

This is the largest of the duikers and is found singly or in pairs in forest. It occurs in the Mau Forest. Its footprint compares both in size and shape with that of a bushbuck. No sample of its dung has yet been found.

Oribi *Ourebia ourebi* (Kiswahili: taya)

Usually found in couples or small parties in thin bush. Sometimes it is found in mountainous country such as the Mau district. Its dung is similar to that of the common duiker but is longer and thinner. Its spoor is similar to but much smaller than that of a hartebeest and apart from the type of country might be mistaken for that of a Thomson's gazelle.

Bushbuck *Tragelaphus scriptus* (Kiswahili: pongo, mbwala)

Found singly or in pairs the bushbuck is generally distributed in forest and bush. It is abundant near Lamu, the Mau district

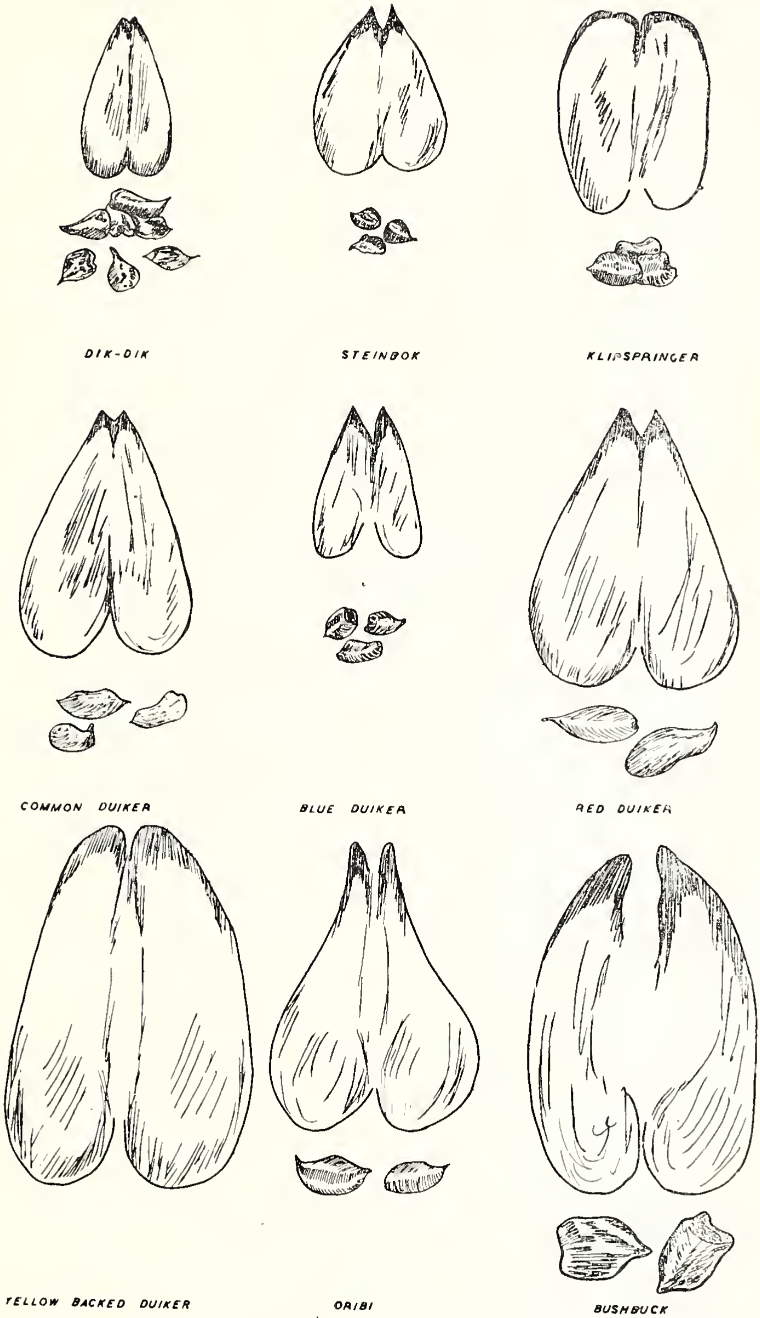


PLATE 1. "*Spoor and dung of E. African Antelopes.*" (natural size).

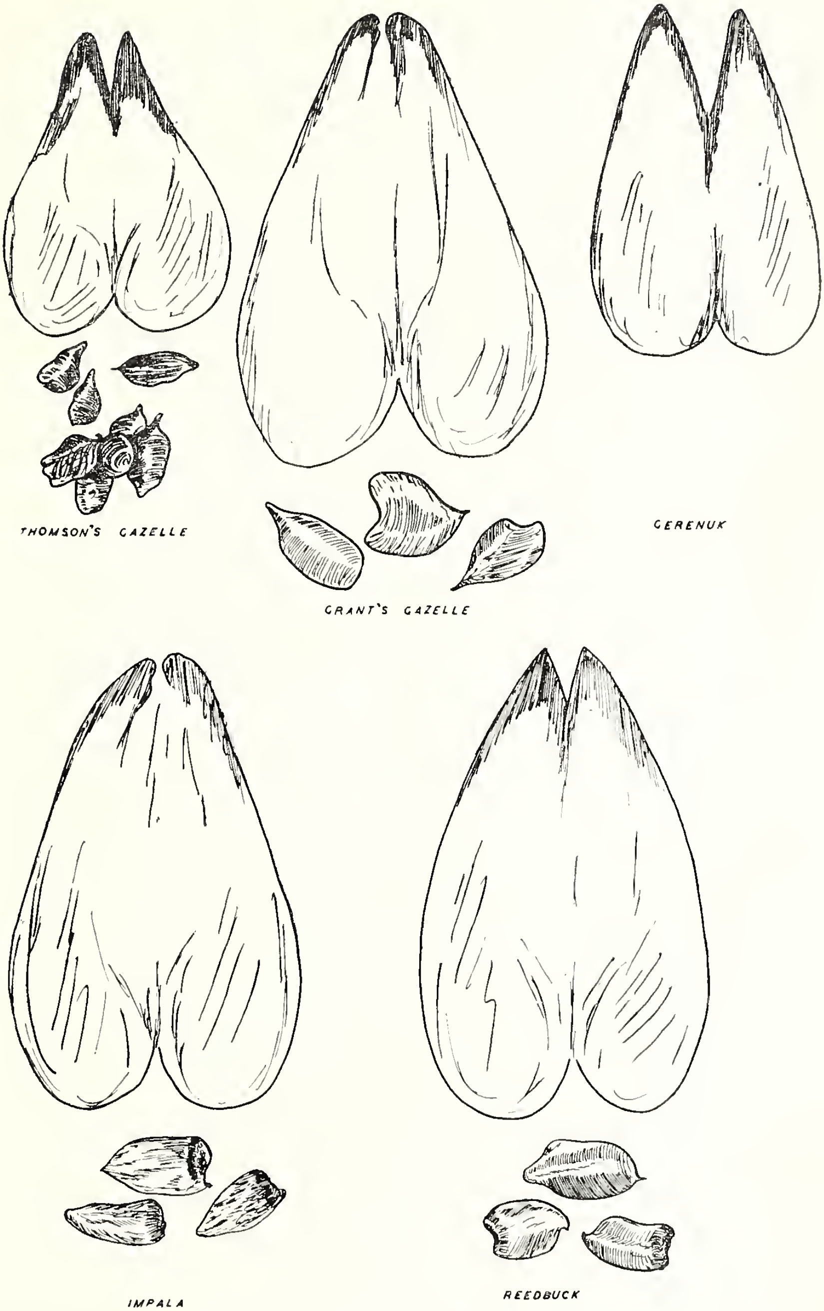


PLATE 2. "*Spoor and dung of E. African Antelopes.*" (natural size).

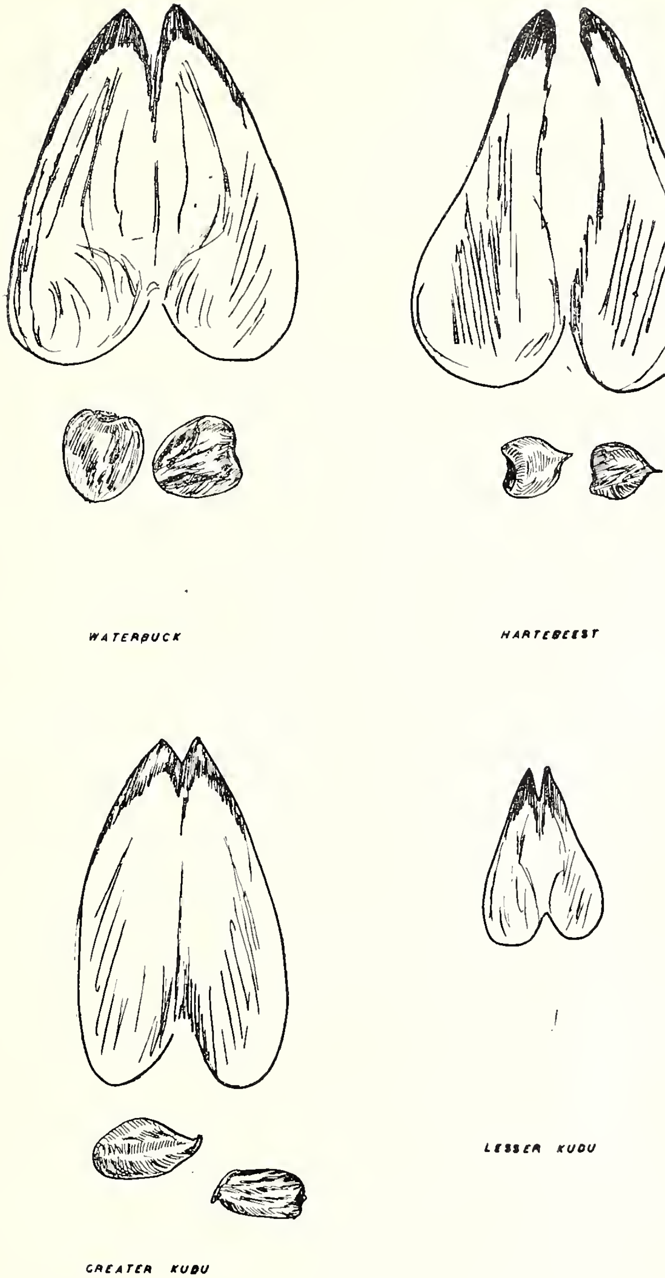


PLATE 3. "*Spoor and dung of E. African Antelopes.*" (half natural size).

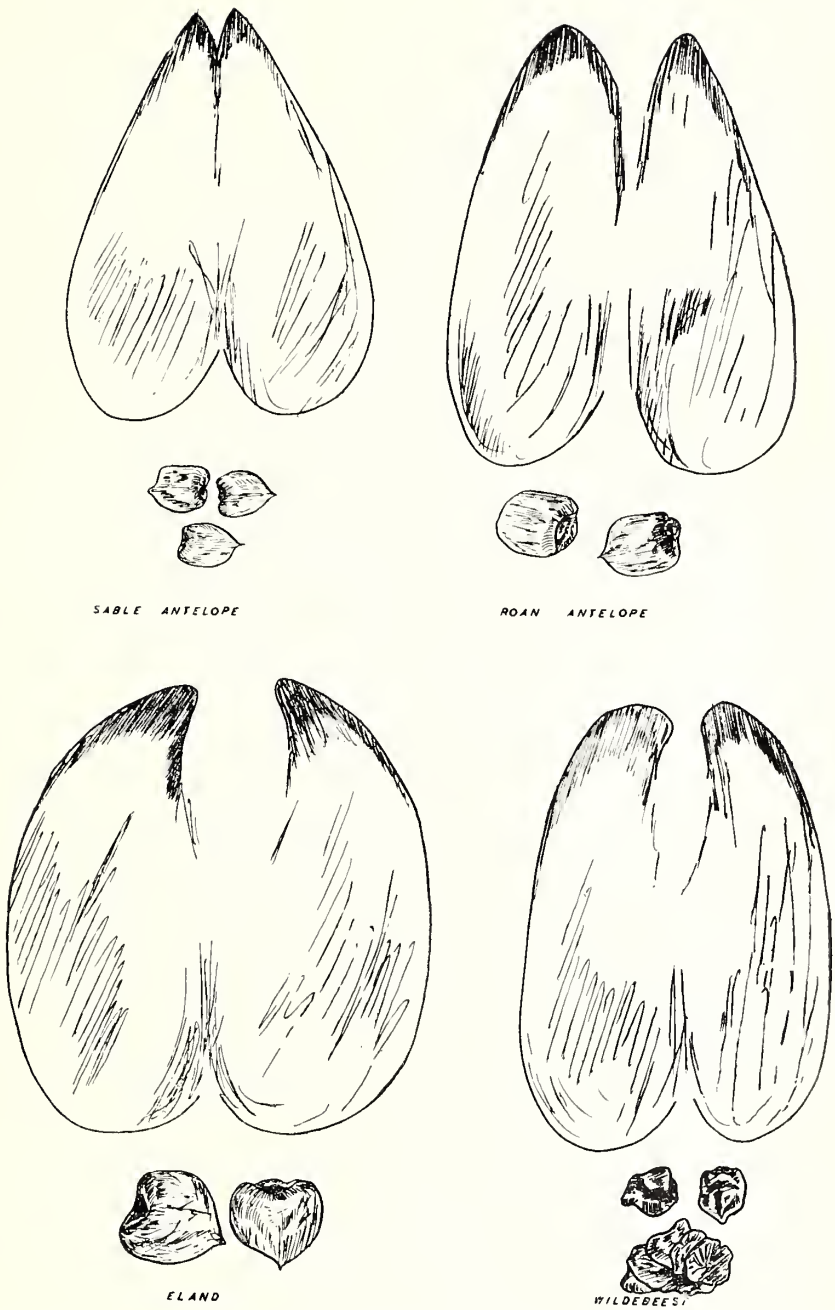


PLATE 4. "*Spoor and dung of E. African Antelopes.*" (half natural size).

Aberdares, Kikuyu, Ithanga Hills, Bukoba, Mwanza, Musoma and Kondoa. The droppings consist of small pellets which are usually found stuck together in an irregular mass.

Thomson's Gazella *Gazella thomsonii* (Kiswahili: lala, kinokera, swala tomi)

These are widely distributed but found mainly in herds on the plains of Masailand. Their dung consists of surprisingly small pellets and is rather variable in shape as shown in the illustration.

Grant's Gazelle *Gazella granti* (Kiswahili: swala granti)

This gazelle is also widely distributed, usually found in herds on open plains but sometimes in *Acacia* bushland. Its spoor is similar in shape to that of the Thomson's gazelle but is twice as large.

Gerenuk *Litocranius walleri* (Kiswahili: swala twiga)

These long-necked gazelle are found in small parties in *Acacia* bushland. They occur in the Magadi-Natron-Manyara part of the Rift Valley, the Tana River area, from Tsavo to Kilimanjaro, the Pare Mts., Kikore and the Umba steppe. No sample of their dung has yet been encountered.

Impala *Aepyceros melampus* (Kiswahili: swala mwekundu, swala pala)

These are found in herds all over East Africa except near the coast or in forests. The spoor approximates in size and shape to that of a Grant's gazelle but its dung is thinner and without the "pear-shape" of the latter.

Reedbuck *Redunca arundinum* (Kiswahili: tohe)

Reedbuck are found in couples or small groups in reedy valleys, open grassland and thin forest. They are known to occur on the Athi Plains, along the Tana River, the Ithanga Hills and Buiko. The footprint is normally sharply pointed at the tip which helps to distinguish it from that of the Impala which often occurs in the same district.

Waterbuck *Kobus ellipsiprymnus* & *K. defassa* (Kiswahili: kulo, ndogoro)

These antelope are found in herds, small groups or as a solitary bull in bush, forest and reeds. The two races become mixed in the Aberdares and Ngong district. Their droppings vary with the seasons, being hard and as illustrated in the dry season but soft and cattle-like during the wet season.

Hartebeest *Alcelaphus buselaphus* (Kiswahili: kongoni)

These are found in herds on the plains and in open bush; they are very common on the Athi Plains. The spoor is about the same size as that of the waterbuck but is much narrower at the tip. The dung is similar in shape to that of an eland but is considerably smaller.

Greater Kudu *Strepsiceros strepsiceros* (Kiswahili: tandala)

Found singly or in pairs in bush and scrub country, the Kudu has been recorded from Marsabit, Mt. Rulat, Baringo, the country north of Elgon, along the Tana River, Kigoma, Tabora, Dodoma, Iringa, Mbeya, Mpwapa, Kondoa, Bagamoyo and Songea. In spite of its weight the kudu makes only a very slight track, its footprints being more narrow than those of the other large antelope. Its dung tends to be barrel-shaped.

Lesser Kudu *Strepsiceros imberbis* (Kiswahili: tandala mdogo)

The Lesser Kudu is found singly, in pairs or in small parties in thick bush and dry, stony country. It occurs in the Shimba Hills, at Lamu and at Nyeri. Its spoor is only half the size of that of the Greater Kudu and could be mistaken for the track of a Thomson's gazelle. No sample of its dung has yet been found.

Sable Antelope *Hippotragus niger* (Kiswahili: palahala)

Found as a solitary bull or in herds in thin forest and bush, this antelope occurs in the coastal region of Kenya as far inland as Voi, at Lake Jipe, Kilosa, Geita, Songea, Tunduru and Kilumbi. The spoor is similar to that of a waterbuck but much larger and the dung resembles that of the hartebeest but with straight sides coming sharply to a point rather than gradually rounding off.

Roan Antelope *Hippotragus equinus* (Kiswahili: korongo)

This antelope is found as a solitary bull or in small parties in thorn bush and open forest. It has been recorded from the Mau district, the Uasin-Gishu Plateau, Tabora, Kigoma, Mbeya, Kondoa and Ufipa. Being heavy and hard treading, these animals usually leave well marked tracks which although about the same size as those of the Sable, are more broad and curved at the tips. The dung is similar in shape but nearly twice as big as that of the Sable.

Eland *Taurotragus oryx* (Kiswahili: pofu)

The Eland is found in herds in bush or open grassland. It is fairly common on the Athi Plains, Ithanga Hills, Guas Ngishu, Nyeri and Baringo. The spoor of this heavy antelope is deep and well defined except on hard ground. Being almost semi-circular at the tip. the footprint can be confused with that of a small buffalo.

Blue Wildebeest *Connochaetes taurinus* (Kiswahili: nyumbu)

Wildebeest are found in large herds on open plains. The spoor is usually well defined as the animal treads heavily. The dung consists of surprisingly small pellets which are however, normally found as fairly large, compressed masses.

OBITUARY

H. J. ALLEN TURNER

Although Allen Turner only joined the permanent staff of the Coryndon Museum in 1941, he had been associated with the organisation of Museum Services in Nairobi from the very beginning.

The first Museum in Kenya was a small building — now pulled down — which stood near the present Kingsway Police Station. It was built for the East African Natural History Society in 1911, and was very small. Turner, who had only been in the country a few years prepared many of the first exhibits. From then on Turner collected for the Museum in all branches of its work, and again and again prepared exhibit specimens.

When the second Museum, which is now the C.I.D. Headquarters, was built, he again co-operated in the preparation of the new Museum for opening, and added many more exhibits to it, while keeping so much in the background that few people realised the extent of his work.

When the Coryndon Memorial Museum building was put up and the Society transferred its collections there in 1929 and gave up its other building, Turner again played a big part in arranging the exhibits, and added to them on very numerous occasions, from that time onwards.

As a field collector Turner was outstanding. His powers of observation and his knowledge of so many branches of Natural History so extensive, that again and again he was able to collect specimens new to science, which might otherwise have passed unnoticed for many more years. To him was due the discovery of the rare water porcupine in Nyanza Province, to him the honour of finding birds and insects new to science, to him we owe the discovery of not a few important prehistoric sites. In botany too—although not a botanist—he was always on the lookout for new and rare plants, and found not a few that had previously escaped notice.

As a museum technician Turner was especially skilled in plaster casting and his reproductions of fish and reptiles is unsurpassed. He also was excellent at making models from photographs and drawings, and his hand-made models of the first Coelocanthe and of various extinct fossil fishes have been, before now, mistaken for casts, when in fact they were merely created from photographs.

With his passing Kenya has lost a man who did more for the advancement of its Natural History than any single other person.

L. S. B. LEAKEY.

On November 27th 1953 Henry J. Allen Turner passed away at the age of 77 years. Allen, as everybody knew him, was a dearly beloved character known throughout the Colony, and also to many naturalists outside

Kenya. His general field knowledge was considerable, as he had collected for most of the great museums all over the world.

Turner came to the Colony in 1909 as a taxidermist to Messrs. Newland and Tarleton, the Safari outfitters, in order to take charge of the trophies of the Roosevelt expedition which was led by the late Colonel Roosevelt and his son, Kermit Roosevelt. When Mr. Edmund Heller stayed on Turner accompanied him as collector and taxidermist, and the great collection of East African specimens now in the Smithsonian Museum, Washington, owes a tremendous lot to his care and skill. For many years Turner collected for many of the big museums, and he was renowned for the beautiful condition in which his specimens were despatched.

It is not generally known that for several years he ran a nursery garden on the Kinangop, and introduced into Kenya many of the bulbs, flowering shrubs and fruit trees which we now take as a matter of course.

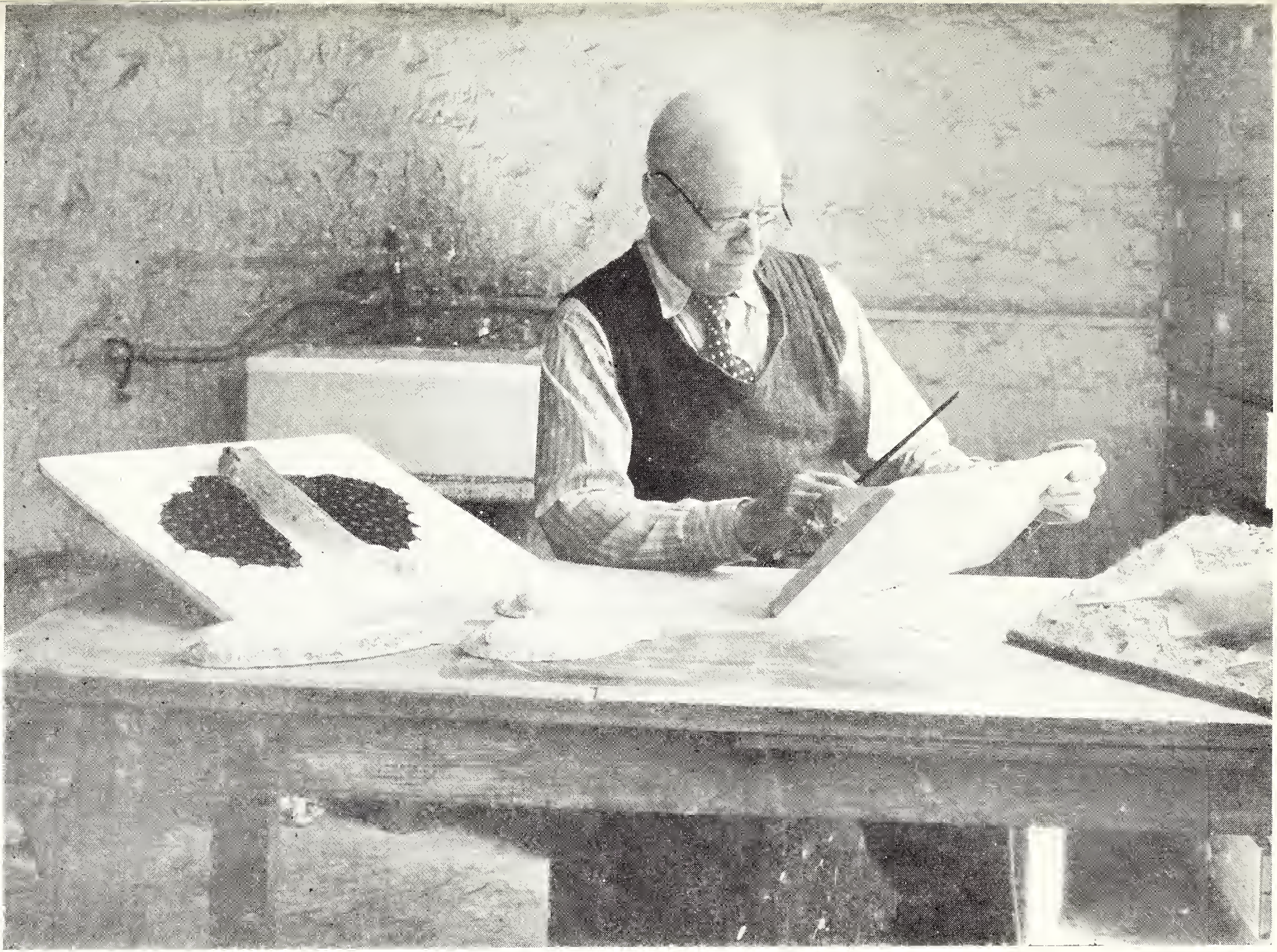
His association with the Natural History Society dates back to its inception; he was intimately bound up with its development and was one of its most loyal supporters. When the embryo museum started in 1911, Turner prepared the birds and mammals which formed the nucleus of the present collections of the Coryndon Museum. He saw and actively participated in the move to the original drill hall; then to the present Coryndon Memorial Museum; and finally in the crowning glory of the new extensions. It was a great day when he saw these halls opened to the public by His Excellency the Governor; and I know how deep were his feelings that he should live to see his hopes so worthily fulfilled. I remember that after the crowd had gone that evening, he and I were quietly walking through the new Churchill Hall and he turned to me and said : "You and I never expected to see this day, but we have and I am content" : — a tribute to his beloved Museum.

Turner's real love was fishes, and his work in modelling these creatures was supreme. For those who follow him he has left the exhibits in the Churchill Hall as a lasting tribute to his artistic skill. To my mind, much of his work in modelling lizards — and particularly frogs — cannot be equalled anywhere else in the world.

From early days he sat in at the councils of the Natural History Society, and he was for many years a Vice-President. In the early years he was a great fighter for the preservation of the fauna and flora of the Colony, and never ceased to press forward the need for National Parks, in committee, when on delegations to the Government, or in the Press. His satisfaction was deep when National Parks became a part and parcel of the Colony.

Many a lady visitor to the Museum expressed the opinion that Turner was "a dear", and that word thoroughly expressed his character. He was indeed "a dear"; but he was also a sturdy fighter if ever the future of his Natural History Society, his Museum, or his birds and animals were in danger.

H. Copley.



H. J. Allen Turner working on fish casts at the Coryndon Museum.

A PERSONAL APPRECIATION

Natural History suffered a great loss on the death of Mr. H. J. Turner in November last and it is felt that a few personal reminiscences may be of interest to his many friends.

My first acquaintance with Allen Turner started over 30 years ago. After leaving school I made a trip round Africa with my mother and stayed a considerable time in Nairobi. During that period some time was spent in assisting Dr. van Someren in the development of the first small Museum belonging to the Natural History Society situated near the Norfolk Hotel. One day a large man dressed in riding breeches and leggings with a wide hat and wearing not inconspicuous side whiskers called at the Museum. He asked me if I was interested in beetles. In reply I said that there were few forms of life for which I had a higher regard, and he expressed delight. He then produced several cartridge boxes containing a fine collection of beetles which he had made at Kakamega in 1915 and subsequently when doing war work on Lamu and Manda Islands. These insects were in excellent condition and had been very carefully preserved. Allen Turner then said that he would like to give me this collection if I would take an interest in it and have them named and worked out. The collection was later taken by me to London and was returned to this country when I came here permanently to live in 1926. It is now in the Coryndon Museum collection. This was the beginning of our friendship and co-operation in the collection of Coleoptera which lasted until his death.

At that time and for some later years, Allen Turner was employed by Sir John Ramsden and was for some time Manager of the Naivasha Creamery. In 1932 when the so-called "Gold rush" occurred at Kakamega, Allen Turner, H. L. Geeson and myself went together to try our luck at this new venture. We duly pegged an area of land on one of the most attractive sights in an area situated on Kuhu Hill overlooking the Yala River. After a great deal of enthusiasm had been expended, our results were very similar to the majority of prospectors. We saw no gold whatever but did not lose a great deal of money. After Geeson and I had returned to Nairobi to our normal occupations, Turner remained at Kakamega but needless to state the only acquisitions made were some very interesting insects new to the Museum collection. A year later the British Museum sent an expedition to collect on certain East African mountains and their first objective was the Aberdare range. We all stayed at Turner's house which was situated by the Naivasha Forest Station and we accompanied the expedition during their trip over the mountains. It is an interesting fact that, although most of the members of the expedition were young men in their early twenties, Allen Turner who was then probably in his early sixties always led the way. This was by no means easy going as it rained almost continuously and the ascent of the Aberdare Mountains, although short, is, through the bamboo zone much steeper and much harder going than similar areas at the same altitude on Kenya and Kilimanjaro.

After a year or two Allen Turner was given a job at the East African Pavilion which was opened at the Johannesburg Exhibition. This he enjoyed very much and I am sure added greatly to the interest of visitors by his stories of the early days in East Africa.

A further important expedition which Allen Turner accompanied was one organised by the East African Natural History Society to the Chyulu Hills. Here the expedition stayed for five or six weeks, and conditions were not made more comfortable by the fact that all water had be carried some six or seven miles.

Soon after the last war started in 1939, Allen Turner joined the permanent Staff of the Coryndon Museum as taxidermist and general preparator. Here he remained doing the work he loved until the last illness before his death. His work is well-known to many visitors by the beautiful coloured casts of fishes which are exhibited in the Fish Hall.

Although Turner was a general field naturalist of high standing, in later years his greatest interest was in adding to the collection of insects and he always showed a particular affection for the Coleoptera. Many new species of beetles discovered by him have been named after him and it always gave him particular pleasure to see the large number of insects bearing the name "*turneri*" in the collection. Although his knowledge of entomology was confined mainly to observation in the field, he had a wonderful eye for a "species" and often when out collecting he would remark on picking up an insect he felt this was something new either to Science or to the collection. He was a true Cockney by birth and was always a genial companion on safari, his unfailing sense of humour and kindly spirit were a continual joy to all those who had the pleasure of being with him on these occasions.

After a long illness he died at the age of 77 and his loss to East African natural history is irreparable.

A. F. J. GEDYE.

BOOK REVIEWS.

THE BIRDS OF THE BELGIAN CONGO

By James P. Chapin.

Part III

being Bulletin of the American Museum of Natural History,
Volume 75A. New York : 1953. pp. 821.

The first part of Dr. Chapin's work was published as American Museum of Natural History Bulletin Vol. 45 in 1932 and covered the families Ostriches to Button Quails inclusive. The second, Vol. 75 of the Bulletin series, appeared in 1939. It dealt with the remainder of the Non-passerines, ending with the Woodpeckers. The third, the present part, has occupied Dr. Chapin for 15 years, subject to wartime interruptions. It comprises the Passerine families of the Pittas and Broadbills, Larks, Wagtails and Pipits, Bulbuls, Cuckoo-shrikes, Babblers, Warblers, Thrushes, Flycatchers and Swallows. The remaining Passerines will be dealt with in Part 4, which will appear as No. 75B of the Bulletin in 1954.

The reviewer is impelled to say at the outset that he is quite sure all interested in African ornithology, indeed bird-lovers everywhere, will wish the author health and strength to complete this great work with his own hand.

The plan of Part 3 adheres to that of previous volumes. Each family is prefaced by a key to the genera which the family comprises. Then each bird, be it race or monotypic species, is dealt with in a separate article. Where a bird has not yet been recorded for the Congo, but probably does occur there, it is given a short article but under an italicised heading in square brackets. Keys to the species, and occasionally to races, precede the treatment of the forms to which they relate. There are 14 plates of photographs at the end of the book before the index and 36 figures in the text.

The contents of the separate articles are arranged in the following order : —synonymy and literature-references, specimens examined, distribution, indication of differences between races so far as concerns the Congo and neighbouring areas, habitat, and finally general field notes, nests and eggs. In this last Dr. Chapin, where he may not have material of his own, occasionally permits himself to reproduce, with acknowledgements, the observations of others.

One feels that this is a book by an ornithologist for ornithologists, and so willingly dispenses with long detailed descriptions for which reference can be made to existing works. So also with 'English' names : Dr. Chapin points out how inapt such a name as Crombec is for the Sylviettas, and he

might have gone a good deal further. Roberts' invaluable book is, for the English reader, disfigured by scores of names which have obviously had to be invented for the occasion and which he can neither pronounce, understand, or remember. It is found that European boys quickly learn at least generic names in the simple 'Latin' of scientists, and it is surely better to refer to a bird as a Bradypterus than as a Swamp Warbler when it neither lives in swampland nor sings.

In general, the families and genera in this book follow the order of Sclater's Systema, but Dr. Chapin emphasizes that in the Timaliidae, Sylviidae and Muscicapidae the dividing lines are not always clear. Here, as in the matter of size of genera and deciding how much difference from a near relative entitles a bird to be regarded as a separate species, and how much as a geographical race only, opinion must come in. One qualified person may take one view, another another. There is no mathematical formula which can be applied to express the numberless degrees of relationship; we have at most only three words to express what a form may show, and must just do our best. It seems to this reviewer that Dr. Chapin steers a fair midway course between "lumpers" and "splitters". In the matter of other people's naming of races, one senses that if a competent ornithologist living so to speak on the spot, and with an obviously adequate mass of material before him, has decided that such-and-such a population constitutes a nameable sub-species because of the (stated) differences which it exhibits, then Dr. Chapin does not lightly cast that name into a synonymy. If in such a case he does reject the name, he gives his reasons and the reader is in a position to judge for himself. Would that this example might be generally followed.

Birds do not recognize political boundaries. Especially in the particular case of the neighbouring forests of Ituri and West Uganda, there is such a close resemblance between the avifaunas of the Congo Belge and the British territories in East Africa, that there is little Dr. Chapin writes that can be said to be without bearing on some bird or birds within our borders. To go into every such relationship would take up space greater than can be allowed for this review, and the reviewer has therefore looked at the matter from the standpoint most natural to himself as a resident in Kenya and selected some of what seem to him the most interesting cases which affect our Kenya birds, whether in systematics or nomenclature; at the same time reminding the reader that other selections might equally well be made from the viewpoint of a birdman for the other territories.

To give some details :—

First, the family Alaudidae. The singing bushlark so commonly heard and found breeding at Magadi in the rains (if they fall) is shown, following Grant and Praed, to have been wrongly named *cheniana* in the Systema: it should be *Mirafra cantillans schillingsi* Rchw. In a footnote Dr. Chapin suggests that the matter may be carried still further: the race name

may more properly be *meruensis* Sjostedt, and the whole *cantillans* group be referred to the south-eastern species *javanica* Horsfield. That would make, if both suggestions are adopted, our bird *M. javanica meruensis. M. albicauda,* also found in Kenya, e.g. at Nakuru, must be closely related to *javanica* also, it would seem, although specifically distinct. This reviewer can vouch for it that the songs of the Magadi birds are strikingly like that of *M. cheniana* in the Orange Free State, but that neither is ordinarily a mimic, such as are both *javanica* in Australia and *albicauda* in Kenya.

Dr. Chapin is not satisfied of the correctness of the division of the plain-backed pipits (Fam. Motacillidae) into two sibling species, a light coloured one *vaalensis* and a dark one *leucophrys.* He would leave all in *leucophrys* (the earlier name). The form *goodsoni* (found at Nakuru) thus remains *Anthus l. goodsoni.* Otherwise it would become *A. vaalensis goodsoni.*

Most of Van Someren's new races described from the Chyulu Hills are sustained, upon the principle, no doubt, to which reference is made above. The colour-differences between the various Yellow Wagtails (to which the generic name *Motacilla* is restored instead of *Budytes*) are carefully described: only one species, *flava,* is recognized for all.

There are three small Bulbuls found side by side in Kavirondo forests, *Andropadus c. curvirostris, A. gracilis gracilis* and *A. ansorgei kavirondensis* (the *Charitillas g. kavirondensis* of the Systema). The differences are pointed out: it lies now with field observers in that locality to see whether nests and eggs can be distinguished.

For the *Pycnonotus* bulbuls the specific name *barbatus* is used to include all the species from North Africa to the Cape Province except *capensis* and *nigricans*: and there is at least a hint that these two, and *xanthopygos* of Syria and Aden, might also be brought into the same category. Field workers would agree: there is scarcely any noticeable difference between any of them in habits, voice, nest or eggs, and the existence of overlap anywhere is doubtful.

The co-existence of *Phyllastrephus terrestris* and *P. strepitans* on the coastlands of East Africa is accepted. It would be of interest to know exactly what differences there are in nests and eggs in those areas.

The genus *Nicator,* hitherto placed among the Shrikes, is removed to the Bulbuls, and the East African form *gularis* is accorded specific rank. Neither of these decisions will command universal acceptance, but reasons are given.

In the *Campephagidae* the species *Campephaga quiscalina* is separated, but the rest, in which the males may have a red or a yellow shoulder-patch, or none, are treated as intergrading geographical races of one widespread

species *phoenicea.* This seems a good and natural solution of a long-standing difficulty.

The forest-inhabiting babblers which up to now have been variously grouped under the genera *Alcippe, Turdinus, Ptyrticus, Illadopsis* and *Pseudoalcippe* are re-arranged into three genera — *Malacocincla, Ptyrticus* and *Pseudoalcippe*; and, as is done in Jackson, the bird formerly called *Alethe poliothorax* is added to the assemblage as a *Malacocincla.* We have in Kenya, of these little known birds, *M. fulvescens* and *M. rufipennis* represented by races at Kakamega, and *M. pyrrhopterus* and *P. abyssinicus* at higher levels. For *M. poliothorax* a locality in Kavirondo is given.

In *Turdoides*, the 'Happy Family' genus of scrubland Babblers, the suggestion is made that *plebejus* and *jardinei* form but one species. Of these, *plebejus* is the older name. That would give us in Kenya two races of *plebejus*, namely *kikuyuensis* from the Escarpment to Mau, and *cinereus* in the Nyando Valley and north to the Turquel. But note that *T. melanops* (not hitherto questioned as a separate species) is found alongside *plebeius* at Naivasha and Kisumu so that care in identification is necessary since this is a genus of which all members are much alike in habits, voice, nests and eggs.

Coming to the *Sylviidae*, Dr. Chapin agrees with Austin Roberts that by priority the yellow-bellied, grey-backed Eremomelas ought to be called *E. icteropygialis* and not *E. flaviventris* or *E. griseoflava*, since there is but one species and the first is the earliest name. Another group of Eremomelas, *pusilla-canescens*, are also brought together into a single species, for which the name must be *pusilla.* Our one form in Kenya (Highlands west of Rift) becomes *E. p. elgonensis* VanS. (incidentally, the reference to the B.B.O.C. near the top of p.269 should be to Vol. 62, not Vol. 61).

The genus *Apalis* (for which we may congratulate ourselves on the fact that no given 'English' name seems to have a chance against the scientific one) has long created taxonomical trouble, in the two widespread groups which may be called the spot-chests and the bar-throats respectively. In the former, the *flavida-caniceps* group, Dr. Chapin considers all should be united under one specific name, though Dr. Van Someren and Messrs. Grant and Praed think otherwise. Once again, it is mainly a question of the ordering of known facts, though we might usefully have more skins from the area of alleged overlap of species on the east side of Lake Victoria. In the second, the bar-throats, we have as a comparatively recent addition to our avifauna *griseiceps* from Chyulu. This is treated by Dr. Chapin as probably a race of *thoracica* of South Africa, which would lead to the welcome simplification of there being but one species all the way up from the Cape with, however, some striking racial differences en route.

We may thank the meticulous care which Admiral Lynes devoted to the genus *Cisticola,* for the fact that so few forms, considering how large a

genus it is, have been added since his day. The chief change, for which indeed Lynes himself was prepared, is in the transfer of the species *angusticauda* to *Cisticola* from *Apalis.* One cannot yet feel altogether satisfied that *chubbi* and *hunteri* may not form a single species, but Dr. Chapin merely raises the point without deciding more than that they are closely inter-allied, as field acquaintance shows.

The question of the best arrangement of the forms commonly grouped under the genus-name *Calamocichla*, and in particular whether we have to do with a sibling pair of species, does not seem to the reviewer convincingly settled. Dr. Chapin finds there are in fact siblings, both widespread, a smaller one *gracilirostris* with in Kenya the races *leptorhyncha* on the coast, *jacksoni* at Kisumu and *parva* in the Highlands; and a larger species *rufescens* which so far as we in Kenya are concerned occurs only on Lake Victoria, in the race *nilotica* side by side with the small bird *jacksoni.* Against this, nobody else has questioned that the Naivasha bird, *parva*, despite its unfortunate name, must be regarded as a large species, since the type measured in the wing 78 mm., well inside Dr. Chapin's key measurement of "males usually exceeding 73 mm". Dr. Chapin, however, considers that another criterion may be usefully applied; for he says that all the races of *gracilirostris* in tropical Africa differ from *rufescens* in having the base of the mandible pinkish-buff and the lining of the mouth bright orange. Yet Dr. Van Someren writes of *nilotica* (1922 p.231) that it has the gape orange in the adult and yellow at earlier life-stages. The nests shown in the text-figure on Dr. Chapin's p.448 as those of *rufescens* are very like, both in structure and attachment, those of *parva* found in papyrus on Lake Naïvasha, and quite unlike those of *jacksoni* at Entebbe, whose eggs, also, are noticeably smaller than *parva's.* Jackson (p.1046) describes nests of *parva* at Naivasha but seems to imply that they were not built in papyrus but in reeds near papyrus. If that is what he means, such a site for any *Calamocichla's* nest has not been seen by the reviewer, who has found many in the papyrus. Can Jackson's nests have been those of the smaller sibling? And may it be that he just did not happen to come across the nests of the larger species in papyrus ? Here is some work for the young and keen to take on. We need much more material.

Chloropeta, undoubtedly in all its habits a genus of Warblers, is removed, one hopes for good, from the flycatcher family. *C. similis* Richmond, the forest-dweller, is recognised as being distinct from the brushwood and river-margin inhabiting *C. natalensis.* For two birds whose songs are so dissimilar, it is surprising that it is so hard to find any consistent difference in the eggs.

The removal of *Hylia* to the Warblers is perhaps not so clearly justified, but if it does not deserve a family to itself it at all events is no Sunbird: nidification and egg show so much. Among *Turdidae, Erythropygia barbata* of the coast and the next belt of country inland is taken into the

southern genus *Tychaedon,* while the migrant *Galactotes,* which in its races *syriacus* and *familiaris* is a winter-visitor to Kenya, becomes a member of *Erythropygia* as has long been suggested by writers. The *zambesiana-leucoptera* assemblage, now treated as one species, and the distinct species *hartlaubi,* are all that is left of *Erythropygia* as it formerly was. This is another useful simplification: there is much variation in the amount and depth of breast-markings in these 'African Nightingales' as the Percivals of Mamandu used to call them, as might be expected with a bird widespread over differing levels, but all the nests and eggs are much alike.

The robin-like *Sheppardia cyornithopsis lopezi* is noted as occurring in Kavirondo. *S. sokokensis* Van S. from the Sokoke Forest can hardly be more than a race of the same species, constituting one more instance of a bird found in the country about Lake Victoria and turning up again at the coast in slightly different form, with no near relatives on the intervening higher ground.

Large specimens of the Common Wheatear appear from time to time in Kenya as winter migrants. These are now tentatively assigned by Dr. Chapin to *Oenanthe oe. rostrata.* But 'Ibis' 1931 p.234 should be referred to. Another migrant wheatear is common about Nairobi and Karen buildings at the same season; its name is now *Oe. pleschanka* again, this antedating *leucomela* which has been for some time in use.

Neocossyphus, a rare bird but a striking one, must surely have been omitted from Jackson by oversight. It occurs sparsely in the coastal scrubs of Kenya.

The changed systematic arrangement of the better known thrushes of the genus *Turdus* will cause some surprise among field ornithologists. Dr. Chapin rests his conclusions, however, on field observation as well as on the study of skins of all forms involved. The result is that the Kurrichane Thrush of the Systema, which is there accorded a distribution from the Transvaal right up to Senegal, is now limited to the south of a line which may be roughly described as Tanganyika, Katanga, North Angola. Uganda birds (*centralis*) which have been considered as conspecific with the Kurrichane and are very like that bird in habits, nests and eggs, are now placed in one species with the Olive Thrush of the Cape (*olivaceus*): this species is now treated as extending over most of the continent north to Eritrea on one side and the Gambia on the other. But excluded from *olivaceus* are the forest Thrushes found from Mlanje Mountain north and north-eastwards through Ruwenzori, Kivu, Kenya and the eastern highlands of Tanganyika to Abyssinia and Eritrea, in suitable localities of course. These now become races of *T. abyssinicus* Gmelin whose type-locality is Abyssinia. *Turdus tephronotus* from Lamu and parts of that coast does not fall to be considered closely by Dr. Chapin, and there is also a form near *centralis* in the Kerio Valley which is at present of uncertain status. It

would be interesting to see a series of skins from the Eritrean high plateau where is would seem that *olivaceus* and *abyssinicus* may meet.

In the flycatcher family, the *Muscicapidae,* the species *Alseonax cinereus* is transferred to the genus *Hypodes*, of Cassin, and its race *cinereus* is considered to include all Kenya birds of the species. It should, however, be kept in mind that van Someren (1922 p.96) found that his race *kikuyuensis* from Kyambu could be distinguished from Voi and Tsavo birds, and that Sclater agreed with this differentiation.

The difficulties in the taxonomy of the sibling pair, and perhaps others, in the genus *Bradornis* are not wholly cleared up. Perhaps study of nests and eggs might help to a solution, for in Ukamba we find the siblings side by side (*microrhynchus* and *pallidus* or *griseus*), the former making a stoutish though small nest lined with feathers or at least generally with some feathers in it and laying uniform olive eggs, while the latter makes a smaller transparent nest and lays heavily marked eggs. *Pallidus* ranges from Nyasaland right up to Eritrea and its eggs, though varying in size, are always of one type: *microrhynchus*' eggs are not yet known except from the drier parts of Kenya and from north-eastern Tanganyika.

For *Alseonax minimus* (Heuglin) Dr. Chapin substitutes the specific name *adustus,* thus making the races in Kenya (*interpositus, marsabit* and *chyulu*) all geographical forms of the Dusky Flycatcher of South Africa. Field naturalists will probably find that this conforms to their own ideas.

The lake-side flycatcher which uses old weavers' nests to lay in, and which is called by Jackson *Alseonax aquaticus,* is put back into *Muscicapa.* The race at Kisumu is *infulata* Hartl. In the genus *Diaphorophyia* (small forest flycatchers not unlike Batis in appearance and habits) the name of the species which we know as *jamesoni,* which inhabits Nandi, is changed to *blissetti* and the Nandi bird in consequence becomes *D. b. jamesoni* Sharpe. Another change in this genus is that *D. ansorgei silvae* of Jackson becomes *D. concreta graueri* Hartert. This is found in Kavirondo.

Terpsiphone (this name is restored for the Paradise Flycatchers in place of *Tchitrea*) is bound to go on causing systematic difficulties owing to the (assumed) hybridisation in West Africa whose effects have spread far to eastward and are observable in Kenya. The crossings have been between two western forest-inhabiting species, *rufiventer* and *rufocinerea,* with *viridis* of bushland and savannas. What Dr. Chapin does is to give us (figs. 28-31) drawings which, if they do not say the last word, will at least help the student to grasp the salient elements in a position so complex that it may fairly be said to have no parallel in the bird-life of the Ethiopian Region.

The Blue Flycatchers which have generally been called *Erannornis* now revert to the older name *Elminia.* From experience, this has the merit of

being easier to spell than the other, but it may be confused in memory with that of the warbler-genus *Eminia*.

One of the three forms of crested and fantailed flycatchers (genus *Trochocercus*) found in Kenya, *T. b. vittatus* Rchw., has its name changed to *T. cyanomelas bivittatus* Rchw. This name is considered by Dr. Chapin to apply to all birds of the species from the coast inland to Mr. Uraguess: but Dr. Van Someren has distinguished central forest birds by reason of larger size.

There are few changes among the *Hirundinidae*, but the generic name of the Grey-Rumped Swallow becomes *Pseudhirundo*, and the Rock Martin of Kenya is to be *Ptyonoprogne fuligula rufigula* instead of *F. r. rufigula* as it is in Jackson. Dr. Chapin seems to suggest that *Hirundo aethiopica* of the tropics might be treated as conspecific with the South African bird *albigularis*. Habits and nidification are the same, and the only differences are in size and the continuity of the breast-band, which seem hardly enough to rest a specific differentiation upon.

This review has emphasized the taxonomic value of Dr. Chapin's work because it is primarily scientific in character and outlook: but in almost every article there will be found something to interest the lover of birds and much also for the general reader, dealing as it does with what is still largely an unspoiled part of a fascinating continent. Those who have already had some experience of nature as it reveals itself in the dark forests of Africa may well, as they read, imagine themselves treading once more on the carpet of damp leaves under the dense shadow of great trees and thick undergrowth, listening awhile as human footfalls cease and the creatures of the primeval wilderness begin to move again, to the rustle of small animals and the voices of a hunting-party of birds following up a line of safari ants for what they can get in the way of insects, be it only the ants themselves.

The reviewer apologises if he has been insufficiently critical. He just does not feel able to criticize. But he can and does appreciate and thank the writer, and with him the native assistant Nekuma, for good work done.

C.F.B.

A PRELIMINARY LIST of the BIRDS OF NATAL and ZULULAND, with a short account of the status of each; prepared by P. A. CLANCEY, Director, Museum and Art Gallery, Durban. October 1953. Published by the Durban Museum. pp. 85.

Zululand is part of the Province of Natal, yet is so often thought of as being a distinct area that Mr. Clancey did well to include the name in his title.

The list comprises 561 species as compared with 875 for the whole Union in Austin Roberts' book.

In general, the arrangement is that of Vincent's Union-wide list (Jack Vincent, A Check List of the Birds of South Africa, Cape Times, 1952). Inevitably, there are departures from Roberts, a highly individualised work, in the treatment of species and races as well as of genera. There is no general agreement on such matters, and there will be no uniform result in print till some accepted outside body acts as arbiter.

The subdivisions of which Mr. Clancey makes use are Orders, Sub-orders (where convenient), Families and Genera. As is done in 'The Ostrich' the names of species are printed in capitals, the same as family-headings. The particular race or races of each species occurring in the area are given in italics below the species-name, and in every case the author of the name, specific or racial, is given following it. Generic names are placed, in roman type, at the head of the species which they comprise. On the right hand side of the page is the English name, and beneath that a few words indicating status. A serial number is given to each species, the series running right through. There is no index, but the list of Families at the beginning enables a reader who has some idea of his birds to find any species he wants speedily.

The whole layout is clear, concise and easily scanned; it would, this reviewer thinks, have been still clearer had specific names been printed in roman type, leaving capitals to family-headings.

One notes a tendency to enlarge the genus beyond what is usual. Examples are:—the genus *Erythrocnus* disappears in *Butorides, Stephanoaetus* in *Polemaetus*, all the other Bustard genera in *Otis*. *Cinnyris* and *Chalcomitra* in *Nectarinia*, etc., etc. Some of these look like stretching the notion of genus even beyond the bounds of what is convenient. Without question, Roberts' narrow view met with scant approval from ornithologists working outside South Africa, and parochialism must be avoided: but it has to be kept in mind that a whole generation almost of young South African bird-lovers have to be brought back gently to the right road if they are to be brought back at all. Mr. Vincent has shown the way: one only hopes that Mr. Clancey may not have overshot the mark by his drastic expansions. It is most important to have the country behind its natural leaders in the science, and understanding why.

In some cases it is thought that Mr. Clancey has been over-ready to accord specific rank where the modern current runs in favour of treating the forms in question as subspecific only. Such instances are *Haematopus moquini, Charadrius marginatus, Larus hartlaubi, Upupa africana, Motacilla lutea, Nilaus nigritemporalis.* No two systematists seem able to agree on what should be done with *Calamoecetor* (or *Calamocichla*) and Mr. Clancey's English names for these birds do not cast any further light. Indeed, necessary as a purge was to get rid of some at least of the names which Mr. Clancey stigmatises as "egregious", it might have been better not to disturb Mr. Vincent's ones for this genus.

There are a lot of cases where it seems best to cut the Gordian knot by using the scientific name as the English one. *Nicator*, where Mr. Clancey does this, is a good case in point: it is easy to remember, it does not prejudice the issue of whether the bird is a Shrike or a Bulbul or something else altogether, and every naturalist who knows the bird uses it already. Why not treat *Batis* the same way ? and why not Cisticola *tout seul* in the case of another much-referred to group ?

Mr. Clancey's List is a most useful contribution to the mosaic of work on the ornithology of the Ethiopian region which by the efforts of many is gradually being shaped into unity; but there are still many almost-blanks to fill, some larger, some smaller. Every ornithologist who concerns himself with Africa must look forward to the day when someone will do for this generation what Reichenow did for an earlier one. The model is there, and could hardly be improved upon, but there have been advances in systematics since Reichenow's day and an enormous mass of material has accumulated awaiting analysis and utilisation. It is a life's work for somebody, English, American or may it be German as before, and it will entail the expenditure of much money : but it will have been worth it if it can be faithfully done.

C.F.B.

A CHECK LIST of the BIRDS of NYASALAND (including data on ecology and breeding seasons). By C. W. Benson, B.A. (Cantab.). Published by the Nyasaland Society (P.O. Box 125, Blantyre), and the Publications Bureau, Secretariat, Lusaka, 1953. Price 6/- (to Members of the Nyasaland Society 5/-).

The author's aims are set out in his Introduction. Since Belcher's book was published in 1930, about 150 forms (including races) have been added to the Nyasaland list, mostly by Mr. Benson or through his efforts. There has thus been a great increase in our knowledge of the birds of the Protectorate : indeed, thanks to the fortunate circumstances of there being on the spot a worker so well equipped for obtaining and assessing information, the rate of ornithological advance has been greater in Nyasaland than in any other part of the Ethiopian Region that comes to mind. Mr. Benson's material has, in the main, already been published from time to time in ornithological journals, but these are not easy of general access and it was an excellent idea to give it now to the general public in this form. Rarely can there have appeared a book on birds in which so much detail has been compressed into so small a compass without loss of clearness or accuracy. The reader must at the outset remember that this is a scientifically-framed list of birds inhabiting or visiting a particular area, and not an account of their habits or a description of their appearance : for such, recourse must be had to other works, to which Mr. Benson makes reference.

The nomenclature, with few exceptions, is that of Praed and Grant in their work on the birds of eastern and north-eastern Africa now in course

of publication; where that is departed from, a reference is given to the authority followed.

After the Introduction, the first part of the book is a description of the various kinds of bird-habitat which are to be found in Nyasaland, divided first into dry and wet areas and then each of these subdivided again into areas which by reason of their distinctive vegetation or other differences in character exhibit corresponding differences in bird life. Every field-worker knows how birds are affected by type of locality, but it has not often been set out so methodically in print for a large area.

The List itself is immediately preceded by a Table of Families which can be scanned at one opening so that, index apart, a species can be found in a moment or two.

With 609 species to be enumerated, all unnecessary matter must, one sees, be cut away; and there must be constant resort to abbreviations. The result cannot help reading a little bare and skeletonized to one who casually dips into the book — the average entry must take up less than an inch — but a little patience will show the ornithologically-minded that this is a veritable mine of exact information, at once a conspectus of the individual species and a guide to amplified accounts. It is thought that a better idea of the nature, scope and value of the book will be given by example than description, and here is one taken at random, which happens to deal with one of the smaller hawks, the kestrel of England and of South Africa :

" 61. Falco tinnunculus. Kestrel. B.57, R.123.

(a) (PM) *F. t. tinnunculus.* Once; Bembeke 1. (67).

(b) *F. t. rupicolus.* Above 2,000 ft. Rocky Hills, on which breeds, also tobacco barns.

(Br.) VIII, 1. Lisiye, tobacco barn (Rf.) 36. 67. "

That terse note, expanded by reference to interpretations of its abbreviations, all to be found in the book, conveys the information that the Kestrel is dealt with in Belcher's Birds of Nyasaland at p.57 and in Roberts' Birds of South Africa at p.123. Next, that two forms of it have been found in Nyasaland; firstly the type race as a palaearctic migrant but with only one record, an occurrence in the month of January at Bembeke, a place 6 miles S.E. of Dedza Boma, which was published in 'The Ibis' for 1940 at p.284, and secondly the South African race as a permanent resident at levels above 2,000 ft. a.s.l., where it inhabits, and nests in, rocky hills. It also nests in the high brick barns in which tobacco is cured on the plantations. The sole breeding record of this resident form in Nyasaland relates to a nest found at Lisiye 8 miles north of Mphunzi in Dedza district in the month of August in a tobacco barn. Finally, further references are given to the Bulletin of the Museum of Comparative Zoology at Harvard, U.S.A., and to "The Ibis".

This will indicate sufficiently how much is told, and how little space wasted.

After the main List, there follow six appendices. The first gives 15 species listed by Belcher but which are for one reason or another now rejected. The second is a list of 'possibilities' — 29 in number. Appendix 3 is a full, if highly compressed bibliography. No. 4 is a gazetteer of all localities in Nyasaland which are mentioned in the work. No. 5 is an alphabetical list of native names of birds, with authorities. Finally, No. 6 is a short 'Addenda'.

There is an Index of Genera, which is all the index an ornithologist needs to any bird-book.

One obvious criticism is that the name of the original describer of the species by the scientific name which it bears in the text, is not given. This is usually done in a work of the scientific importance of Mr. Benson's book, though it was not done by Roberts. The direct uses of giving it are several. A name may be resuscitated after a long interval, or it may be a quite recent bestowal; and in either case one would like to know, why the change? At other times one wishes to be able to check a priority. Or, again, so simple a matter as a mistake in spelling seems to be on the tapis, and yet in certain cases such a mistake must stand; is this one ? There are, indeed, few spelling mistakes to be suspected in the present work, but one does seem to see such in 'baboecala' (415) 'aibifrons' (556) and 'Pogoniulius' (287 and 288). It is perhaps not of great importance to English readers whether the 'umlaut' is there or not in words of German origin such as 'fülleborni': but it changes the pronunciation, and in fact it is the better practice to insert it, if in the original.

There are some items of interest to ornithologists in Mr. Benson's book to which particular attention may be drawn. The evidence for local breeding of the Osprey (nestlings being fed) is convincing if the observer was reliable. Ten occurrences of *Porzana marginalis* indicate that this rail is not so rare as had been supposed. *Clamator jacobinus* is considered responsible for some at least of the blue eggs found in *Turdoides*' nests. It may be remembered that all of this Cuckoo's eggs in South Africa are white, as also was one taken from the oviduct by Jackson at Namanga in Kenya. But Abyssinian eggs described by Erlanger were blue, as are all Indian ones. The data given concerning *Centropus* suggests that possibly the *senegalensis* and *monachus* groups may be conspecific. (The reference to *C. s. burchelli* under No. 212 is not quite clear). Every field naturalist who knows the birds' calls will agree with Mr. Benson in placing *Caprimulgus fervidus* as a race of *C. pectoralis;* one wonders if the same test will confirm the conspecificity of *C.guttifer* with *C. poliocephalus,* which also has a most distinct call. The specific name *narina* for the more common of the two Trogons may or may not be a person's name; one would like to know the origin of it in Stephens' mind. Mr. Benson accepts the view,

rejected by Dr. Chapin, that the long-billed pipits belong to a sibling pair of species, the dark *leucophrys* and the light *vaalensis*. Priority must decide, but it seems a pity that we have to label so common an African species as Richard's Pipit '*novaezeelandiae*'. Mr. Benson indicates that he considers Syrian bulbuls of the genus *Pycnonotus* to be conspecific with tropical birds by using for the latter the specific name '*xanthopygos*', but does not show why the earlier '*barbatus*' should be superseded. A most interesting observation recorded under species No. 433 suggests doubts as to the distinctness of *Camaroptera brachyura* and *C. brevicaudata*. Possibly hybridisation ? At the same time as Mr. Skead is finding evidence of crossing between *Zosterops virens* and *Z. capensis* in the Ciskei, Mr. Benson emphasizes the difficulty of separating *Z. virens* from *Z. senegalensis*. These species seem distinct enough in Kenya; but the whole genus in Africa needs a review in the light of more material than at present seems available. The occurrence of the Mascarene Martin (No. 465) at Lake Chilwa in mid-winter is something wholly new for Africa. A suggestion that *Ploceus nigriceps* is conspecific with *P. spilonotus* and *P. cucullatus* would, if translated into actuality, simplify the taxonomy of a difficult group; *cucullatus* appears to be the oldest name.

In deciding for his list the question, good species or only a race ? — Mr. Benson has leaned towards the older school (perhaps following Messrs. Grant and Praed whose first volume alone has up to now been seen by the public) and away from the biological concept used by Mayr and other modern American writers; but he frequently points out the alternative without adopting it. There are cases of doubt throughout the list : in particular, one notices that of the various Yellow Wagtails, usually treated as conspecific but here as separate species. Differences of opinion will always exist on this head; the unfortunate thing is that until there is some recognized arbiter on at least the Anglo-American level, the differences will go on perpetuating themselves in print, to the puzzlement of the novice who will be the ornithologist of tomorrow and needs encouragement.

This is indeed an excellent book, which everyone interested can afford and should order while it is still in print. It seems to the reviewer as good value, having regard to contents on one side and price on the other, as has been put before African bird-lovers for a very long time.

C.F.B.

THE BIRDS OF WEST AND EQUATORIAL AFRICA by David Armitage Bannerman Vol. One, Struthionidae to Picidae — Vol. Two, Eurylaemidae to Ploceidae. In all pp. 1526. 1953, Oliver and Boyd, Edinburgh. £6.6s. net.

These two volumes represent the pith of the matter contained in the author's great work on the Birds of West Africa which was published by the Crown Agents under governmental authority in eight volumes, of which

the first appeared in 1930 and the eighth in 1951. That larger publication is now hard to obtain: we noticed it recently in a bookseller's catalogue priced at £48 with no indication of condition. The present work is no ordinary abridgment, but a complete rewriting, and in consequence it makes admirable reading. There is an abundance of those black-and-white drawings which do so much more than one would have thought possible to reproduce a bird's true appearance and so facilitate identification, with, for full measure, 54 beautifully executed plates by Lodge, admirably produced. A change of title will be noticed. It was found that three-quarters of the 1536 forms inhabiting West Africa range right across the continent, so that the Congo Belge, the British Territories in East Africa, and the Sudan have geographical representatives of them, if not the identical species or race. These eastern forms are now dealt with in the text, which gives the two volumes a positive advantage over the larger work for ornithologists in East Africa. The merits of the lesser bulk need not be stressed. The same drawings of heads and feet to illustrate family characteristics are here, as in the earlier volumes, and there are as many keys as the field-worker could possibly want. There is less detailed scientific matter, and more general talk about the bird; which is really what is most appreciated by the seeker after retainable knowledge: if one misses anything it is the abundant field notes which were so liberally disposed through the larger work; these have had to be compressed into more general statements of fact from the nature of the new book. We hope that everyone who can do so will get himself a copy of this book while it is still in print: it is an addition to one's library that will surely never be regretted.

C.F.B.

PRINTED BY W. BOYD & CO., (PRINTERS) LTD.

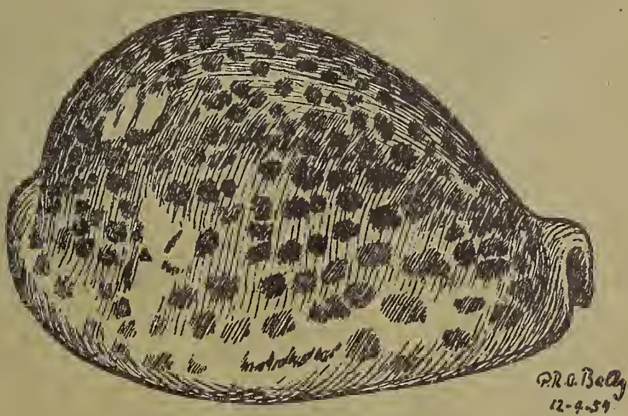
Journal of the East Africa Natural History Society

JUNE 1954. VOL. XXII. No. 4 (96).

SPECIAL NUMBER.

EAST AFRICAN COWRIES.

SMITHSONIAN
SEP 22 1954
LIBRARY



EAST AFRICA NATURAL HISTORY SOCIETY.

PATRONS.

His Excellency The Hon. Sir Evelyn Baring, K.C.M.G., K.C.V.O.

Sir Philip Mitchell, K.C.M.G.

Sir Henry Moore, K.C.M.G.

PRESIDENT.

R. W. Rayner, Esq., B.A., A.I.C.T.A.

VICE-PRESIDENT.

H. Copley Esq., O.B.E.

EXECUTIVE COMMITTEE.

P. R. O. Bally, Esq.,

Colonel M. H. Cowie, M.L.C.

W. Hale Esq., B.A.

J. S. Karmali Esq., B.PHARM., PH.C., D.B.A.

Miss E. J. Blencowe, S.R.N., S.C.M.

J. McDonald Esq., C.B.E., D.F.C.

P. J. Greenway Esq., D.SC., O.B.E., F.L.S.

R. W. Barney, Esq.

SECRETARY.

Miss D. Ewing.

HON. EDITOR.

J. G. Williams Esq., M.B.O.U.

HON. TREASURER.

W. R. Bowles Esq.

HON. LIBRARIAN.

R. A. F. Brenan Esq., M.A.

All correspondence in connection with this Journal should be addressed to:
The Hon. Secretary, P.O. Box 658, Nairobi.

Journal
of the East Africa Natural History Society

JUNE, 1954. VOL. XXII. No. 4 (96)

Cover Design "Tiger Cowry" By P. R. O. Bally.

CONTENTS

THE COWRIES OF THE EAST AFRICAN COASTS (KENYA, TANGANYIKA, ZANZIBAR AND PEMBA)

By Bernard Verdcourt

(East African Agriculture and Forestry Research Organisation)

A desire has been expressed for a paper of this nature and there is an excuse for writing one since all the monographs of which those by Hildalgo, Melvill, Kiener, Reeve, Sowerby and Roberts are the most important are rare and out of print. It is just possible that at least one of the 2,700 papers which have been written about cowries deals with the East African coasts but if so, it is certainly not generally known. The most important work on the group is the recent "Prodrome of a Monograph on Living Cypraeidae" by Dr. F.A. Schilder and Dr. M. Schilder (Proc. malac. Soc., Lond., **23**, 119-231, 1938-9). The volume containing this paper is also out of print. All the species known to occur on our coasts are included in this present paper. Rarities have been included since they are needed for the museum collections.

The Cowries (Cypraeidae) form a family recognisable at a glance, the shells being colourful, polished, more or less ovoid, rounded on the back but flatter below; the base is crossed by an aperture extending lengthways and bordered by ridges or teeth, usually numerous. The spire of the shell is reduced or sometimes entirely absent when adult. There is no operculum or 'lid' closing the entrance of the shell as is the case in most families in the order to which the cowry family belongs. The mantle or part of the body which lays down the shell has two large side flaps which meet over the back of the shell when the animal is in motion thus resulting in the high polish so characteristic of the family. The structure of the shell and general appearance of the animal is shown in Figs. 1 and 2. The sexes are separate but identical in appearance.

At one time the family included several groups such as *Trivia* and *Erato* which are now referred to families of their own. The whole of the cowries were at one time included in the single genus *Cypraea* but this has now been split into numerous genera. Many species have been divided into races or subspecies. In the descriptive part of this paper these accurate names have been used. At the request of the editor English names* have been given to encourage beginners but the collector is recommended to give up this unscholarly practice once he becomes interested and to use at least the specific names. The racial names need not be used but are included here for completeness. There are 165 species of true cowries recognised at present (this number has been much exaggerated in some popular books) and 41 of these are recorded from our coasts by the Schilders, with three exceptions represented only by one subspecies ie. 44 forms in all. The writer has disregarded six of these records but recorded five other species,

*Those used by Wood (Index Testaceologicus, 1828) have been employed where suitable.

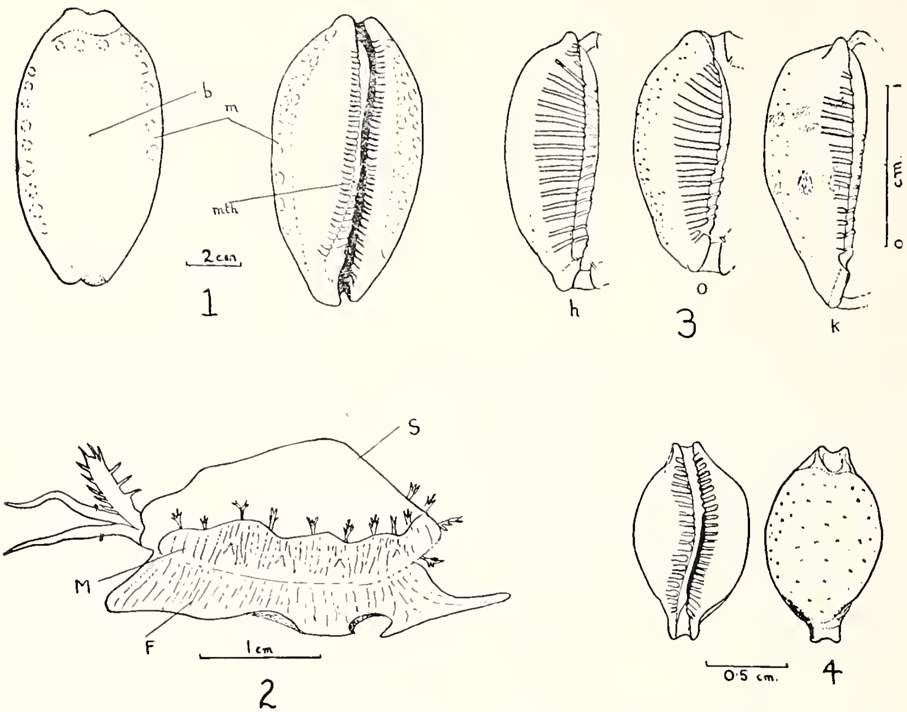


Fig. 1—Top and botttom views of a cowry, b=back, m=margins and mth=mouth.

Fig. 2—A Money Cowry with the animal extended, **F**=foot, M=mantle and **S**=shell.

Fig. 3—Columellar teeth of **h** : *Blasicrura hirundo*, o : *B. owenii*, and **k** : *B. kieneri*.

Fig. 4—Top and bottom views of *Pustularia globulus*.

the total thus being 43. A few of these species were not available for illustration in either the writer's or the Coryndon Memorial Museum collection and the writer is indebted to the following persons and institutions who have kindly made donations or loans of material, or who have helped in other ways :— Mrs. Cockburn, Mrs. Ryall, Mrs. Finch, Miss Lewis, Mrs. Dingle, Mrs. Bailey, Miss Watkins, Miss Tudor, Mr. Barrow, Capt. Pitman, Mr. Mohinder Singh, Mr. Dickie, Mr. Berry, Mr. Clancey, Mr. Parsons, the late Col. Maxwell, Lt. Shelley, Mr. Bailey (Seychelles), Mr. K. D. Smith, Mr. R. C. Wood, The Peabody Museum of Natural History, Los Angeles Museum, The Pietermaritzburg Museum, and The Mauritius Institute.

The photographs are the work of Mr. C. F. Hemming and are largely responsible for whatever value this paper has.

A key based on the scientific classification of the family would not be of much practical value and the one devised is based chiefly on size and colour. After the species has been found from the key, the identification may be checked by referring to the brief descriptions of the species and to the plates. The index to species at the end of the paper refers to both plate and page numbers. It should be noted that juveniles can be identified only by using a comparison collection and the key will work *only* for fresh adult specimens. Juveniles may be told by their unfinished appearance; the edges of the mouth are sharp with only traces of teeth, the pattern is blurred and unformed and the spire is conspicuous. Worn shells should be discarded as unidentifiable and thrown away. Scientific nomenclature is that used by the Schilders and subsequent generic splits have not been utilized.

KEY TO THE EAST AFRICAN COWRIES

1	Shell 5 cm. long or more ...		2
1	Shell under 5 cm. long ...		11
2	Base of shell and/or teeth coloured ...		4
2	Base and teeth white, rarely an obscure blotch on the base ...		3
3	Sides of shell rounded when viewed from end. Lowermost spots purplish-black ...	*Cypraea tigris*	
3	Sides of shell straight when viewed from end. Lowermost spots usually brown ... (Note: some forms of *C. vitellus* are over 5 cm. long but such specimens have not yet been recorded from E. Africa. They would key to *tigris* here but may be distinguished by having white spots on a brown ground.)	*Cypraea pantherina*	
4	Teeth violet, back flesh-coloured ...	*Cypraea carneola*	
4	Teeth not violet, back differently coloured ...		5
5	Shell cylindrical ...		6
5	Shell ovoid ...		8
6	Base and sides uniformly chocolate-coloured ...	*Talparia talpa*	
6	Base and sides paler not chocolate-coloured ...		7

7	Shell 7 cm. long, back with brown rings ...	*Talparia argus*	
7	Shell 10-11 cm. long, back with obscure spots and minute white pinhead marks ...	*Callistocypraea testudinaria*	
8	Back with white line joining the extremities. This line has white blotches joined to it, see Plate 9	*Mauritia mappa*	
8	Back without a line or with a simple line with no blotches joined to it ...		9
9	Sides and base uniformly chocolate or purple brown ...	*Mauritia mauritiana*	
9	Sides and base white, tinted, or spotted ...		10
10	Base whitish, teeth brown. Shell 6 cm. long regularly reticulate ...	*Mauritia histrio*	
10	Base flesh-tinged, teeth brown. Shell 7.5 cm. long. The white spots on the back tend to be joined by white lines ...	*Mauritia arabica*	
11	Teeth violet, back flesh-coloured ...	*Cypraea carneola*	
11	Without the above combination of colours ...		12
12	Back with raised granules or pustules ...		13
12	Back without raised granules or pustules ...		14
13	Shell 1.4 cm. long, lilac with chestnut ends ...	*Staphylaea staphylaea*	
13	Shell 2-3 cm. long, pale brown with whitish pustules, ends not chestnut ...	*Staphylaea nucleus*	
14	Base or teeth coloured or spotted ...		15
14	Base and teeth white or slightly tinged only at the ends or sides ... (N.B.—Several species are included in the key twice because this character is a little difficult and slightly coloured specimens might be included in either group.)		33
15	Shell globular with produced ends, small 13 mm. long and 7.5 mm. wide, orange with brownish spots ...	*Pustularia globulus*	
15	Shell usually larger, never so globular, and ends much less produced ...		16
16	Base dark orange, back with numerous close white specks and chestnut spots, ends pale lilac ...	*Erosaria helvola*	
16	Not as above ...		17
17	Back with bands containing zigzag marks ...		18
17	Back without zigzag marks ...		19
18	Back brown or purple with bands of white zigzag lines; shell 1.6-2.8 cm. long, base whitish ...	*Palmadusta diluculum*	
18	Back fawn or yellow; shell 1.8 cm. long, base yellowish ...	*Palmadusta ziczac*	
19	Sides with clear violet spots, base flesh-coloured, teeth orange-salmon ...	*Cribraria chinensis*	
19	Sides without violet spots ...		20

20	Ends and teeth orange (actually teeth white bordered by fine orange lines), back with white spots often somewhat raised at the sides ...	21
20	Not as above ...	22
21	Teeth crossing the entire base	*Staphylaea staphylaea*
21	Teeth not crossing the entire base ...	*Staphylaea limacina*
22	Sides, base and teeth all dark brown ...	*Erronea onyx*
22	Not as above ...	23
23	Sides uniformly chestnut or dark brown, middle of base and teeth white ...	*Erosaria caputserpentis*
23	Sides spotted, not as above ...	24
24	Teeth or grooves between them darker than the rest of the base ...	25
24	Teeth paler or the same colour as the rest of the base ...	28
25	Grooves between the white teeth brick-red, back spotted ...	*Cypraea lynx*
25	Grooves between the brown teeth whitish, back reticulate ...	26
26	Sides rounded shell cylindric; sides and base pinkish-slate, spotted with blue-black spots, more on one side than the other ...	*Mauritia scurra*
26	Sides more angled, shell ovoid; sides and base whitish or brownish with purple spots equally numerous on both sides ...	27
27	Shell humped, sides more vertical with spots rather large and more discrete ...	*Mauritia histrio*
27	Shell depressed, the sides extended horizontally (margined) with blue-black and brown spots running together. The dorsal reticulation and spots are smaller than in *histrio* ...	*Mauritia depressa*
28	Edges margined, the margins pitted or indented above, marked with spots and lines ...	29
28	Edges not or scarcely margined, not indented, spotted, but without lines ...	31
29	Each side with large squarish blotch of blue-black on margin; base spotted ...	*Erosaria nebrites*
29	Sides without large blotches but with the usual spots ...	30
30	Extremities with terminal chestnut blotches, back with brown spots and whitish specks ...	*Erosaria gangranosa*
30	Extremities not blotched, back with white spots often ringed with brown; sides and base violet tinted ...	*Erosaria marginalis*
31	Shell usually over 2.5 cm. long, base brownish flesh-coloured, grooves between teeth a little darker ...	*Erronea caurica*
31	Shell under 2 cm. long, base white or yellowish, grooves not darker ...	32

32	Base yellow, sides with larger spots ...	*Palmadusta felina*	
32	Base white often spotted, sides with minute dots (N.B.—If the specimen has not yet been identified and you still think it has a coloured base continue with the key—a few species may have a tinge of colour below but still be included in the next part of the key.)	*Blasicrura kieneri*	
33	Back clear yellow, white or greenish-yellow, unmarked or rarely with an orange ring. The sides of the base may be tinged yellow ...	*Monetaria moneta*	
33	Back not as above, if with an orange ring then not yellow ...		34
34	Back with a conspicuous brown blotch on grey-blue ground, edges orange-brown ...	*Blasicrura stolida*	
34	Not coloured as above ...		35
35	Margins spotted with marks usually different from those on the back ...		36
35	Margins not spotted but back pattern may descend down to the margins ...		45
36	Shell conspicuously margined, with indentations round the margins which are also marked with raised dots and dashes; margins with a dark blotch on either side crossing the margin (absent in a rare variety) ...	*Erosaria erosa*	
36	Not as above ...		37
37	Shell margined and pitted (rather obscurely) on one side; small 1.3-1.6 cm. long, ends blotched with chestnut or orange ...	*Erosaria gangranosa*	
37	Without the above combination of characters ...		38
38	Back with bands of zigzag lines ...	*Palmadusta diluculum*	
38	Back without bands of zigzag lines ...		39
39	Shell about 4 cm. long, back pale brown with white spots, sides with numerous dark brown spots ...	*Erosaria lamarckii*	
39	Shell not as above, mostly under 3 cm. long ...		40
40	Back greenish-blue with very numerous distinct brown spots ...	*Erosaria turdus*	
40	Back differently marked not spotted but often with minute speckles or 'freckles' ...		41
41	Shell about 2-2.7 cm. long, back with three interrupted transverse milky brown bands. Side spots sparse ...	*Cribraria teres*	
41	Shell smaller differently coloured ...		42
42	Side spots large, base yellowish ...	*Palmadusta felina*	
42	Side spots minute, base white ...		43
43	Extremities blotched brownish-lilac below, back brownish, side spots almost obsolete ...	*Palmadusta fimbriata*	
43	Extremities blotched blackish above, back blue-green, side spots numerous ...		44

44	Apical columellar teeth the longest (text fig. 3)		*Blasicrura kieneri*
44	Middle columellar teeth the longest (see text for B. owenii (Sow.))	...	*Blasicrura hirundo*
45	Sides of shell and usually the edges of the base broadly dark brown or chestnut	...	*Erosaria caputserpentis*
45	Sides pale, not as above		46
46	Back bluish or pinkish with a bright orange-yellow ring (annulus)	...	*Monetaria annulus*
46	Back without a yellow ring	...	47
47	Back white with three strong chocolate-brown bands	...	*Palmadusta asellus*
47	Back without or with vague bands	...	48
48	Back brown speckled with white spots	...	49
48	Back not marked with white spots	...	50
49	Shell 2.5-5 cm. long, back milky-brown	...	*Cypraea vitellus*
49	Shell smaller, back brown with numerous round white spots	...	*Cribraria cribraria*
50	Shell elongate about 3 cm. long, slate with lines of dark purplish-black dots and dashes, ends orange (variable).		*Luria isabella*
50	Shell under 2 cm. long, differently coloured	...	51
51	Back with faint pinkish-brown bands and very fine oblique orange hairlines which form angles near the margins (visible under a strong lens and when one knows what to look for they are just visible to the naked eye); not spotted	...	*Palmadusta clandestina*
51	Back whitish, freckled with pale brown, with obscure central band, ends with a conspicuous brownish-lilac spot on each side	...	*Palmadusta fimbriata*

DESCRIPTIONS OF THE SPECIES

Globular Cowry†

Pustularia globulus (Linn.) subsp. *brevirostris* Schilder

Description :—Shell globular with produced ends, 1.3 cm. long and 0.75 cm. wide, back orange often with brownish spots, base yellowish-orange, teeth pale, middle ones running together.

A very rare species, fresh specimens have been seen from the Seychelles (Bailey) and worn specimens from Likoni, Kenya (Ryall). Since the photograph of this species is poor a line drawing is also given (Fig. 4)

Grooved Cowry

Staphylaea staphylaea (Linn.) subsp. *laevigata* Dautz.

Description :— Shell ovoid 1.7-2.0 cm. long, back brownish-purple or greyish-brown, with small white spots and traces of raised whitish granules along the edges; extremities chestnut, base orange tinted, teeth extending across the base. Frequent to rare.

†NB Either spelling Cowrie or Cowry may be used.

Note :— This is a variable species which tends to merge with the next one. One form of it is sufficiently different to be remarked upon. This form is short about 1.4 cm. long, back grey-lilac with raised whitish granules. It corresponds with the descriptions of some of the eastern races and needs further investigation.

False Grooved Cowry

Staphylaea limacina (Lmk.) subsp. *interstincta* (Wood)

Description :— very similar to the smooth form of *S. staphylaea* but larger 2-2.7 cm. long, back purplish-brown with white spots; teeth not extending across the base. Frequent.

Wrinkled Cowry

Staphylaea nucleus (Linn.) subsp. *madagascariensis* (Gmel.)

Description :— Shell ovoid ends produced, about 2.6 cm. long, back with brownish pustules joined by ridges, whitish or pale lilac in worn shells; teeth extending over the entire base. Rare.

Malindi (Pitman); Dar es Salaam (Mohinder Singh); Shanzu (Finch).

Gangrene Cowry

Erosaria gangranosa (Dill.) subsp. *reentsii* (Dunker)

Description :— Shell small ovoid, 1.3-1.6 cm. long, back yellowish-brown or greyish with numerous whitish spots and a few obscure brown spots, ends with chestnut blotches on either side, sides whitish with obscure spots, one side margined and punctate. Ends orange below, rest of base white. Rare. I have seen no East African material. Schilder says rather rare. Specimens are probably in existence in some of the many private collections in the country.

Star Cowry

Erosaria helvola (Linn.) subsp. *argella* Melv.

Description :— Shell ovoid 1.8-2.8 cm. long, one side margined and pitted, back variable, turquoise or pale with close small white spots and larger superimposed chestnut spots in varying proportions, extremities pale lilac, margins and base orange-chestnut, a band just above the margins deep to very deep chestnut. Common.

Snake's Head Cowry

Erosaria caput-serpentis (Linn.) subsp. *caput-serpentis*

Description :— Shell ovoid, base flattened and margins angled, 2.7-3.6 cm. long, back whitish with a reticulum (network) of chestnut or dark brown (equivalent to white spots on a dark ground) and often a white line joining the pale ends; margins and edges of base dark brown or chestnut, middle part of base and teeth white. Common.

Margined Cowry

Erosaria erosa (Linn.) subsp. *erosa*

Description :— Shell ovoid, sides margined and ridged, 2.1-4 cm. long (much larger specimens occur in some other areas); back bistre or grey-

brown with numerous small whitish spots and a blue-grey line connecting the ends; margin with brown ridgelets and a squarish grey-brown blotch in the centre of each side crossing the margins. Base whitish with few orange-brown spots on one side. Teeth coarse extending to one margin. Frequent.

Note :— Another race or subspecies is supposed to occur rarely but I have not identified it amongst any material I have seen. A very striking variety lacking the side spots or blotches is represented in the Museum collections by two specimens — Dar es Salaam (Dingle) and Mombasa (Leete). The status of this needs further investigation.

False Margined Cowry

Erosaria nebrites Melvill

Description :— Very similar indeed to *E. erosa* but the blotches do not extend over the margins and are more chestnut than greyish. These blotches are often joined across the back by a darkish zone. The species is also more triangular and the base is tinted and spotted. Rare.

Note :— I have seen one unlocalised specimen from our coasts and it is identical with one which I have from Port Sudan. Schilder claims that the two should belong to different races *nebrites nebrites* and *nebrites mozambicana* but I see no difference in the solitary specimens I have seen; rather would I seriously question the absolute specific identity of this taxon from *E. erosa*.

Rare Margined Cowry

Erosaria marginalis (Dill.) subsp. *marginalis*

Description :— Shell ovoid 2.6 cm. long, back pale olive with white spots, some ringed with brown; sides and base tinted with violet, edges with purple dashes and dots. Teeth numerous. I have seen no specimens of this rare species from our coasts.

Lamarck's Cowry

Erosaria lamarckii (Gray) subsp. *lamarckii*

Description :— Shell ovoid about 4 cm. long, back bistre or pale brown with numerous whitish spots some of which have purple dots in them; and a pale line joining the ends. Margins and ends with dark brown spots, base pale. Frequent.

Thrush Cowry

Erosaria turdus (Lmk.) subsp. *turdus*

Description :— Shell ovoid, base rather flattened, about 3 cm. long, back pale greenish-blue with very numerous yellow-brown spots like a thrush; sides white with large spots and some indented dots near the ends, base and teeth white. I have seen no specimens from our coasts but the species is very abundant in the Red Sea.

Schilder records the nominate subspecies as frequent and the subspecies *zanzibarica* Sull. as rare on our coasts.

Ringed Cowry

Monetaria annulus (Linn.) subsp. *camelorum* (Rochebr.)

Description :— Shell ovoid 2-2.7 cm. long, back bluish, pinkish or greyish margined by a fine bright orange-yellow ring (ie an annulus); margins very pale flesh, base white. Abundant, one of the commonest cowries. It lives on sandy bottoms.

Money Cowry

Monetaria moneta (Linn.) aggregate.

Description :— Shell ovoid, 1.5-2.6 cm. long, white to deep yellow or greenish-yellow, base mostly white. Common. Schilder records only fossil *M. moneta* from East Africa but this must be a slip.

Note :— There is supposed to be a rarer species similiar to *M. moneta* — *M. icterina* (Lmk.). This is reputed to be more elongate, larger and supposed to have minute differences in the teeth. I cannot satisfactorily distinguish these species nor have I been able to understand the supposed differences mentioned in Schilder's statistical paper on the genus *Monetaria*.

Onyx Cowry

Erronea onyx (Linn.) subsp. *adusta* (Lmk.)

Description :—Shell ovoid about 4 cm. long, back dark chestnut sometimes with obscure bands across and an obscure line joining the ends, base and sides dark brown, teeth red-brown. Rare. Two specimens in the Coryndon Museum. Mombasa (Tudor).

Thick-Edged Cowry

Erronea caurica (Linn.)

Description :—Shell ovoid or elongate-ovoid, 2.5-3.5 cm. long, rather thickened at the edges, back pale bluish or white densely mottled with khaki freckles, usually but not always with two pale bands readily distinguishable. Sides flesh-tinted, with dark purple-brown spots, base tinted with flesh colour, the grooves between the strong teeth being darker. Very abundant.

Notes :— There are two races recorded *elongata* (Perry) and *dracaena* (Born) but I have not distinguished these satisfactorily amongst the several hundred specimens I have seen. This species has often been wrongly determined in East Africa as *Luria lurida* a totally dissimilar Mediterranean species. Who began this absurdity I can not imagine! It has also been confused with *Cribaria teres* — the dorsal patterns are a little similar but the teeth are entirely different.

False Three-Banded Cowry

Palmadusta clandestina (Linn.) subsp. *passerina* (Melv.)

Description :— Shell ovoid about 1.7 cm. long, pinkish or pale bluish, faintly banded, ornamented with faint yellowish-brown hairlines which form angles here and there (a lens is needed to see them at first until one knows just what to look for). Rare. I have seen only three local specimens.

Three-Banded Cowry

Palmadusta asellus (Linn.) subsp. *asellus*

Description :— Shell ovoid 1.3-2 cm. long, whitish with three distinct bands of chocolate-brown across the back. Schilder does not record this from our coasts but I have seen about seven specimens of it. Rather rare.

Pale Zigzag Cowry

Palmadusta ziczac (Linn.) subsp. *misella* (Perry)

Description :— Shell ovoid 1.8 cm. long, back whitish with transverse brownish bands and darker intermediate areas of yellow or fawn zigzag lines, base yellow. Rare. Mombasa (Dickie).

Dark Zigzag Cowry

Palmadusta diluculum (Reeve) subsp. *diluculum*

Description :— Shell ovoid 1.6-2.8 cm. long, back dull purple or chestnut with two marked and one less distinct transverse band of white zigzag marks, ends with purple-brown marks, sides with chestnut spots, base white. Frequent.

Cat Cowry

Palmadusta felina (Gmel.) subsp. *felina*

Description :— Ovoid, about 2 cm. long, back blue-grey with obscure yellowish bands and abundant small khaki freckles. Sides with blackish-purple spots, ends with similar spots on either side, base and teeth yellowish. Rather rare but Schilder states 'common'.

Note :— Similar to the Swallow Cowries but side spots much bigger.

Small-Toothed Cowry

Palmadusta fimbriata (Gmel.) subsp. *durbanensis* Schilder

Description :— Shell ovoid or ovoid-elongate, about 1.5 cm. long, back whitish or faintly blue tinged, with numerous pale brown freckles and a double brownish band across the middle. The ends have a conspicuous purple-brown spot on either side. Base white, teeth small. Rare. Likoni (Ryall); Mombasa.

Note :—Specimens of this have been wrongly called *P. microdon* (Gray) in collections in Nairobi. Schilder records the race *chrysalis* Kiener of *microdon* as a fossil from Mombasa. The specimens I have seen are undoubtedly *fimbriata* which Schilder does not record from north of Mozambique.

False Swallow Cowry

Blasicrura kieneri (Hidalgo) subsp. *kieneri*

Description :— Shell ovoid 1.2-2 cm. long, whitish or yellowish on the back with three blue-grey zones partly separated by narrow crooked pale zones. There are irregular blotches and tiny spots of dark purple-brown and chestnut on the sides and fine brown specks all over the back. There is often a dark interrupted band crossing halfway across the back, and two purple-brown blotches at either side of the ends. Base and teeth whitish. The columellar teeth (i.e. the teeth on that side of the mouth that continues into the shell) are longer at the top (particular the top three) than they are at the bottom (text fig. 3). Common.

True Swallow Cowry

Blasicrura hirundo (Linn.) subsp. *francisca* Schilder

Description :— Very similar to the last species but sides thicker. Back lacking the dark interrupted band, teeth rather fine about 16-17 columellar teeth in shells 17 mm. long. The columellar teeth are longest in the middle and gradually become shorter towards the ends (fig. 3). I have seen no specimens from our coasts.

Note :— In the Coryndon Memorial Museum there is an unlocalised specimen which *may* have been collected on our coasts. It is *Blasicrura owenii* (Sow.). It is similar to *hirundo*, but more ovoid, with the sides more margined. The marginal spots are more numerous and the teeth are longer and coarser, there being about 12 columellar teeth in shells 17 mm. long. *B. owenii* is recorded by the Schilders from Mauritius, Madagascar and Natal. The specimen agrees best with the Mauritian race which may well extend northwards but until further material has been collected this record remains dubious. *B. owenii* is figured in the plates and *B. hirundo* may be identified from fig. 3.

Square-Spotted Cowry

Blasicrura stolida (Linn.) subsp. *diauges* Melv.

Description :— Shell ovoid margined on one side, about 3 cm. long, ground colour of back grey-blue with minute brown specks and a large trapezoidal brown mark about 1 cm. long in the middle of the back; there are two vertical brownish streaks on the side which is margined, and on the other side two less distant stripes join with horizontal stripes which extend to the ends. The ends and margins are spotted or marked with orange-brown and the base although predominantly pallid is faintly tinged with the same colour. The only fresh specimen I have seen of this rare species is a superb shell collected at Sandy Bay, Ukunda by Mrs. Parsons. Kilifi (Lewis, very worn shell).

Long Cowry

Cribraria teres (Gmel.) subsp. *alveolus* Tapp.

Description :— Shell ovoid-elongate 2.3-2.7 cm. long, back white with

palest blue tinge with numerous yellow-brown markings which may be described as forming three diffuse transverse bands and five to six longitudinal bands, none of solid colour. Sides and base whitish, a few brown spots on the sides. Teeth rather fine. Rather rare. Shanzu (Finch). Diani Beach (Watkins) and several unlocalised specimens.

Note :— This species is a little like *E. caurica* but has totally different teeth.

Violet-Spotted Cowry

Cribraria chinensis (Gmel.) subsp. *violacea* (Rous.)

Description :— Shell ovoid about 3 cm. long. back tinged bluish marked with fine khaki pattern, margins flesh-coloured with conspicuous violet spots, base flesh, grooves between the strong teeth orange-salmon. Uncommon.

Note :—also called *C. cruenta*, a later name.

Spotted Cowry

Cribraria cribraria (Linn.) subsp. *comma* (Perry)

Description :— Shell ovoid 1.6-2.2 cm. long, back brown with numerous round white spots giving a conspicuous speckled appearance. There are traces of three bands. The margins and base are pure white. The animal is scarlet. Rather rare. Shanzu (Finch), Malindi (Tweedie).

Isabelline Cowry

Luria isabella (Linn.) subsp. *isabella*

Description :— Elongated shell, more or less cylindrical, up to 3 cm. long, back pale slate or dull brownish-purple with longitudinal interrupted lines of dots and dashes in dark brown, ends orange, base white. Teeth numerous. Common.

Tortoise Cowry

Callistocypraea testudinaria (Linn.) subsp. *ingens* Schilder

Description :— Shell large, elongate 10-11 cm. long, back brown with brownish spots and white indented pin-point-like spots, base flesh-coloured or brownish, teeth white. Rare. Zanzibar, Jardini (Dingle). There is a fine specimen from the Mozambique Channel (Laing) in the Coryndon Museum.

Pheasant Cowry

Talparia argus (Linn.) subsp. *contrastriata* (Perry)

Description :— Shell elongate cylindrical, 7-8 cm. long, back pale brown, three-banded, covered with numerous brown rings, base ornamented with two or four large dark brown spots, usually two on either side of the

---

Bérnaya teulérei Caz. There is a dubious record of this from Zanzibar and it is here omitted. *B. fultoni* (Sow.) might also occur.

brownish mouth. Rare. The only local specimen I have seen is one from Malindi collected in the lagoon within the outer reef (Shelley).

Mole Cowry

Talparia talpa (Linn.) subsp. *imperialis* Schilder

Description :— Shell elongate about 6 cm. long, ground colour pale yellow with four broad brown bands, base dark chocolate brown, grooves between teeth pale. Frequent.

Map Cowry

Mauritia mappa (Linn.) subsp. *alga* (Perry)

Description :— Shell ovoid, pear-shaped 6-7 cm. long, back brownish to violet-brown with rows of hieroglyphics and a wide white line joining the extremities. This line is peculiarly branched with blotches joined to it by stalks, along its length. Base and sides white or pink, teeth rich orange. The sides have numerous small conspicuous purplish spots extending over the base. Schilder states 'rather rare' but I have seen no local specimens. R. Wood has collected it at Mombasa (*in litt.*), The one figured is a specimen from the Philippines.

Jester Cowry (also known as Green-Spotted Cowry).

Mauritia scurra (Gmel.) subsp. *scurra*

Description:—Shell cylindrical, sides rounded, about 4.3 cm. long, back blue-green with olive-chestnut reticulation. A line connecting the ends is not reticulate but of the ground colour. Sides and base pinkish-brown or slate. Lateral spots blue-black, more on one side than the other, teeth chestnut. I have seen only one specimen — Kilifi, Aug. 1953 (Lewis). This was collected on the outer reef in deep water at low tide. Schilder does not record this species from our coasts but as it occurs in Mozambique its appearance here is not surprising.

Arabic Cowry

Mauritia arabica (Linn.) subsp. *immanis* Schilder

Description :— Shell ovoid with flat base, about 7.5 cm. long but variable, back yellowish with irregular chestnut lines interrupted by scattered spots, also a pale line joining the ends. Sides bluish-white or flesh-tinted with large purple-black spots. Base bluish or flesh-tinted, teeth chestnut. Fairly common.

Harlequin Cowry

Mauritia histrio (Gmel.)

Description :— Similar to *M. arabica* but smaller, 5.2-6.2 cm. long, back with a regular netted (reticulate) pattern enclosing white spots, base white. Common.

Flattened Harlequin Cowry

Mauritia depressa (Gray) subsp. *dispersa* Schilder

Description :— Similar to *M. histrio* but much more depressed and sides distinctly margined and expanded. Marginal spots blue-black and brownish, superimposed and running together. Back chestnut, reticulate, but the spots in the reticulation and the side spots are much smaller than in *M. histrio*. Base tinted, teeth finer than in *M. histrio*. Extremes of this species are distinct but I have seen intermediates. I have seen a specimen from Dar es Salaam (Dingle) which matches exactly material from the Seychelles. The species is not recorded from East Africa by Schilder.

Black Humped Cowry

Mauritia mauritiana (Linn.) subsp. *mauritiana*

Description :— Shell ovoid with flat base and angled margins, about 8.5 cm. long, back dull purple and yellowish with a superimposed reticulation of chocolate brown, so that the general effect is chocolate with numerous fairly large pale round spots. Margins and base dark purple-brown, teeth dark chocolate, grooves pale, teeth white inside at one end (fossula). Frequent.

Tiger Cowry

Cypraea tigris Linn. subsp. *tigris*

Description :— Shell ovoid, large, 6.5-10.5 cm. long, back whitish with blue or yellow tinge, densely spotted with dark purple-black spots which run into each other and also a longitudinal brown curved line joining the extremities, base white. This species is very variable and very many colour variations occur — some almost unspotted. It is such a well-known species that it will not present any difficulty in naming. The name is a misnomer since no stripes enter into the pattern. Common, often on sandy bottoms. (Schilder states only 'frequent')

Panther Cowry

Cypraea pantherina Solander subsp. *pantherina*

Description :— Similar to *C. tigris* in many respects but less ovoid with the ends more produced and the sides vertical and not rounded. This difference in shape is quite constant and very distinct once it is appreciated. Shell about 6-7 cm. long. The colouration of the back is very variable indeed — white with brownish-purple spots is the most frequent, the lowermost spots being orange-chestnut and not blue-black as in *C. tigris*. Some shells are very different in pattern and even uniformly deep chestnut with only traces of spots showing through. The columellar teeth are finer and more produced than in *C. tigris*. Dar es Salaam (Dingle, Mohinder Singh). This species is common in the Red Sea and readily obtainable there. It has not been recorded from the E. African coast and these records need confirming by the finding of living specimens. They may have been thrown overboard at Dar or mixed in some way with other specimens. Its mention here must not be taken as a new record for our coasts.

Lynx Cowry

Cypraea lynx Linn. subsp. *lynx*

Description :— Shell ovoid 3-4.8 cm. long, ground colour pale buff or yellowish sometimes with a purplish tinge, covered with a mixture of small and large more or less round dark brown spots, base white, edges usually with dark brown spots, grooves between the white teeth orange or orange-red. Abundant.

Fallow Deer Cowry

Cypraea vitellus Linn. subsp. *dama* (Perry)

Description :— Shell ovoid 2.5-4.5 (rarely 5 or even 6 in specimens from other parts of the world) cm. long, back milky-brown with two rather obscure pale bands, marked with numerous white spots of various sizes. On one side of the shell near the margin there are numerous close vertical brown lines which are distinctive but rather obscure. Base white or whitish. Frequent to rather common.

Flesh-Coloured Cowry

Cypraea carneola Linn. subsp. *sowerbyi* (Anton)

Description :— Shell very variable in size and shape, 2.5-6 cm. long, back flesh-coloured with 4-5 darker bands, base pale, teeth bright violet. Very common.

It is hoped that this paper will enable the public to name any cowry they may find on our coasts. It must be emphasised that if this paper is used for identifying cowries from other coasts mistakes are likely to be made. A good collection of Cowries is now housed in a separate cabinet in the Bird Room of the Coryndon Memorial Museum and is available to the public on request.

ADDENDUM

Mr. R. C. Wood has informed me that he has collected *Erosaria poraria* (Linn.) at Mombasa. This species is not recorded by the Schilders for E. Africa and has not been included in this paper. Mr. Wood's information came too late for the species to be properly included but the following data will allow it to be recognised. Using the key it would run down to couplet 14 and then to 15. It can be differentiated from the species that follow by a couplet to be inserted as follows.—

16* Base of shell and margins pale lilac, mouth whitish, back buff-brown with numerous white spots ringed with brown ... *Erosaria poraria*

16* If base lilac then shell not coloured as above ... 16

To the description included in the couplet above may be added — shell about 1.7 cm. long margined on one side, with a few indented pits along the margin.

INDEX TO SPECIES

When the cowry has been named from the plates or the key the following index will show on which page the fuller description may be found. Since many people prefer to lump all the cowries in the one genus *Cypraea* the index is arranged by specific names only.

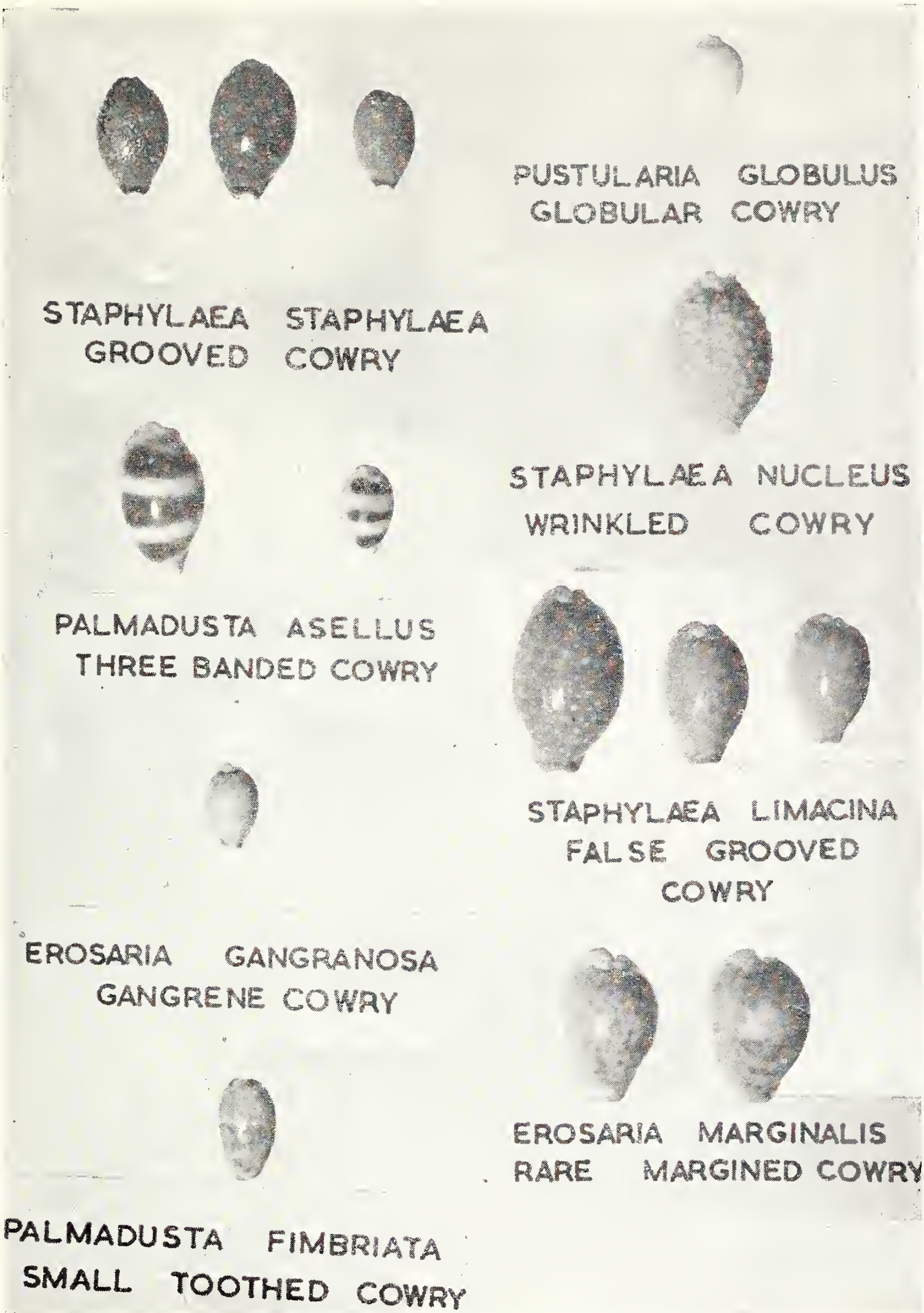


PLATE 1 "*East African Cowries (Natural Size)*"

PLATE 2 "*East African Cowries (Natural Size)*"

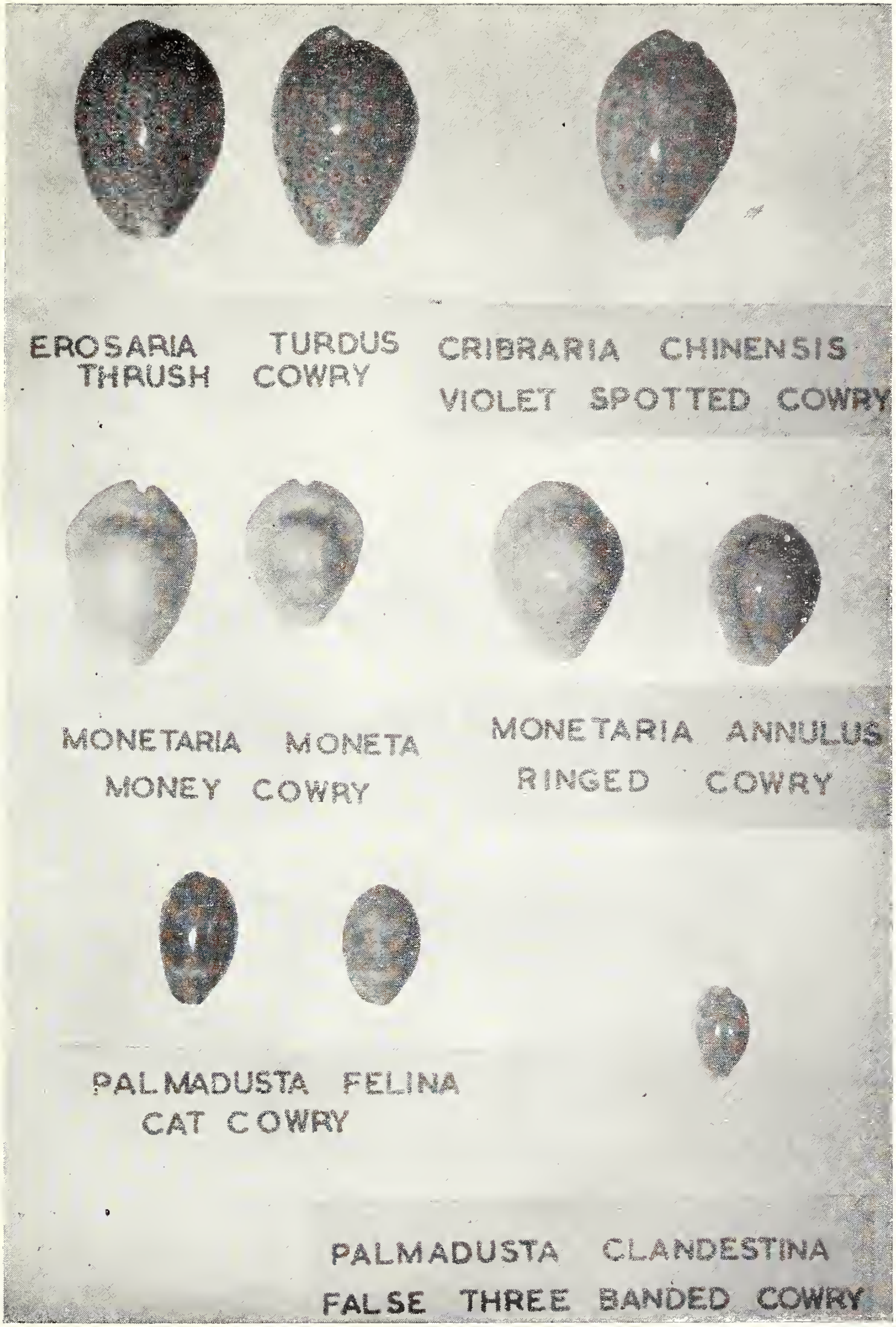


PLATE 3 "*East African Cowries (Natural Size)*"

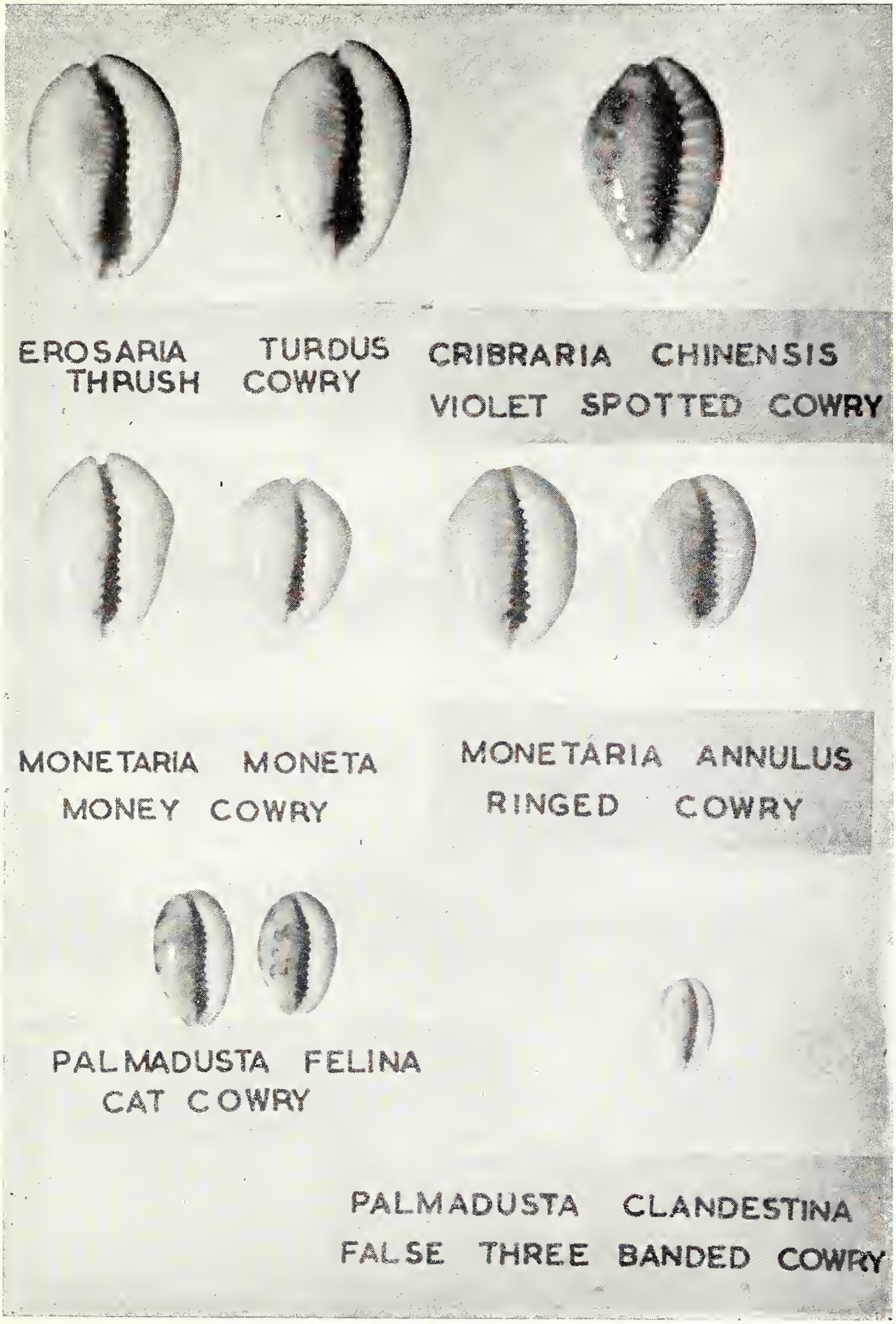


PLATE 4 "*East African Cowries (Natural Size)*"

PLATE 5 "*East African Cowries (Natural Size)*"

PLATE 6 "*East African Cowries (Natural Size)*"

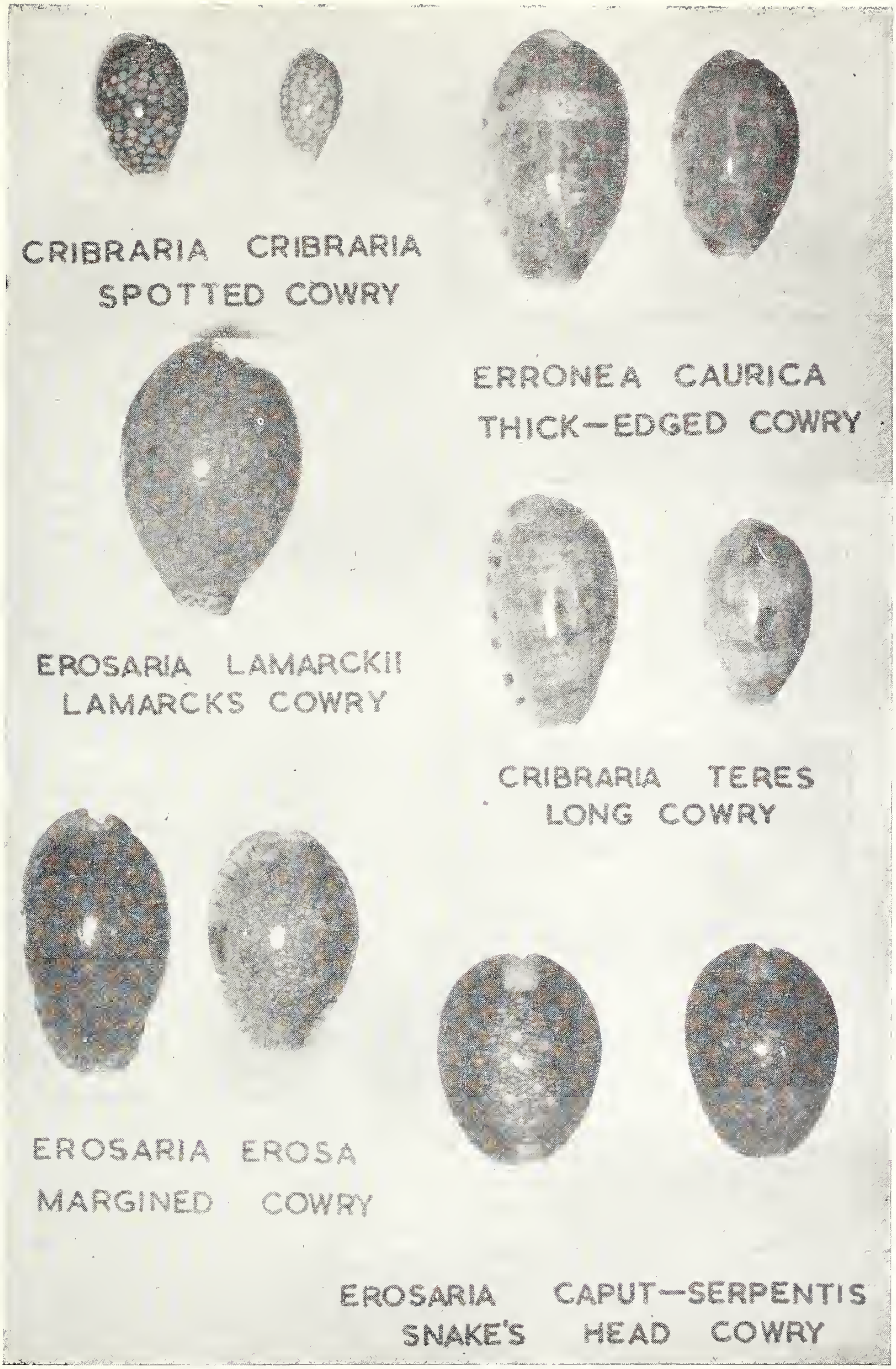


Plate 7 "*East African Cowries (Natural Size)*"

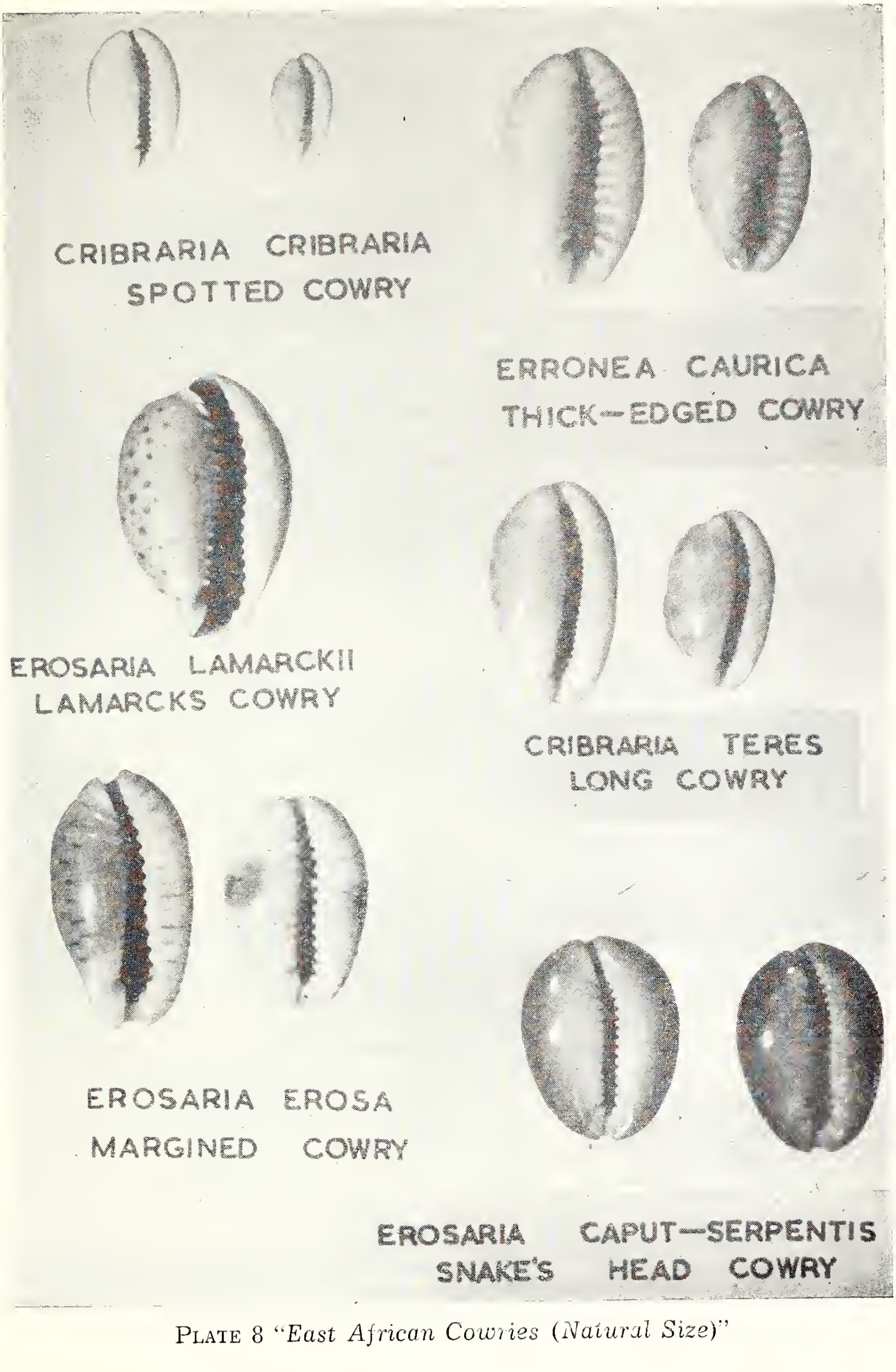


PLATE 8 "*East African Cowries (Natural Size)*"

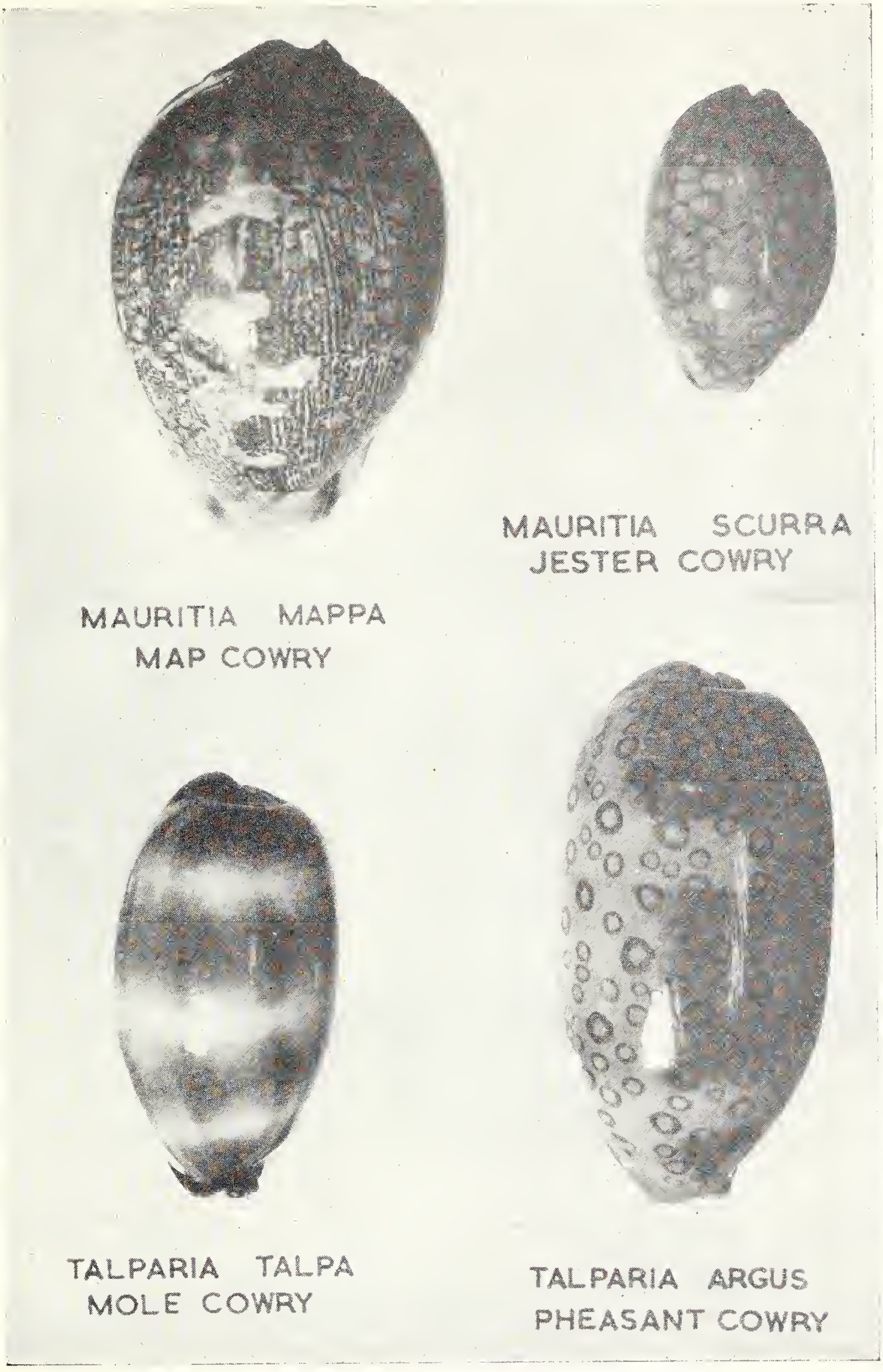


PLATE 9 "*East African Cowries (Natural Size)*"

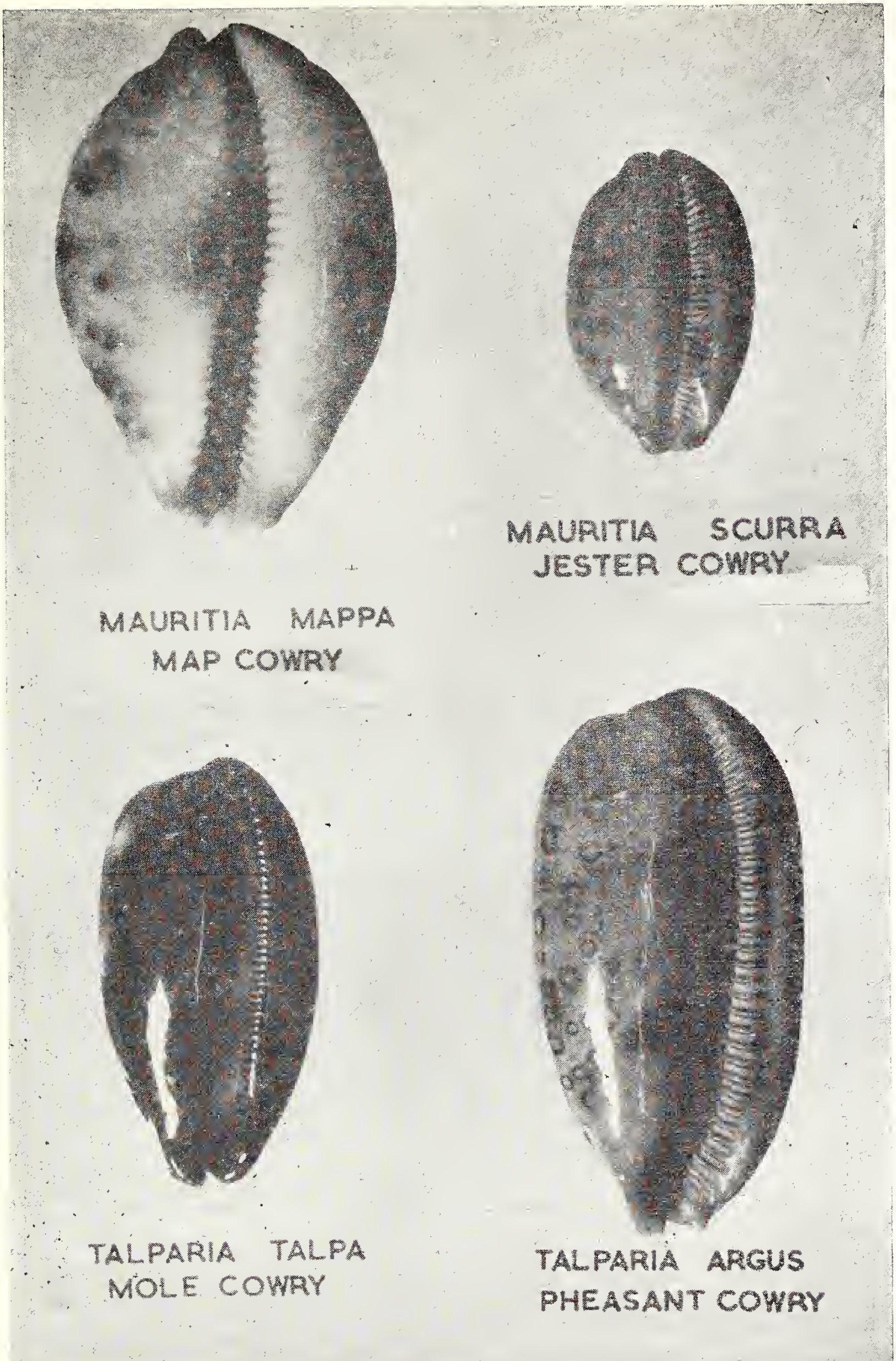


PLATE 10 "*East African Cowries (Natural Size)*"

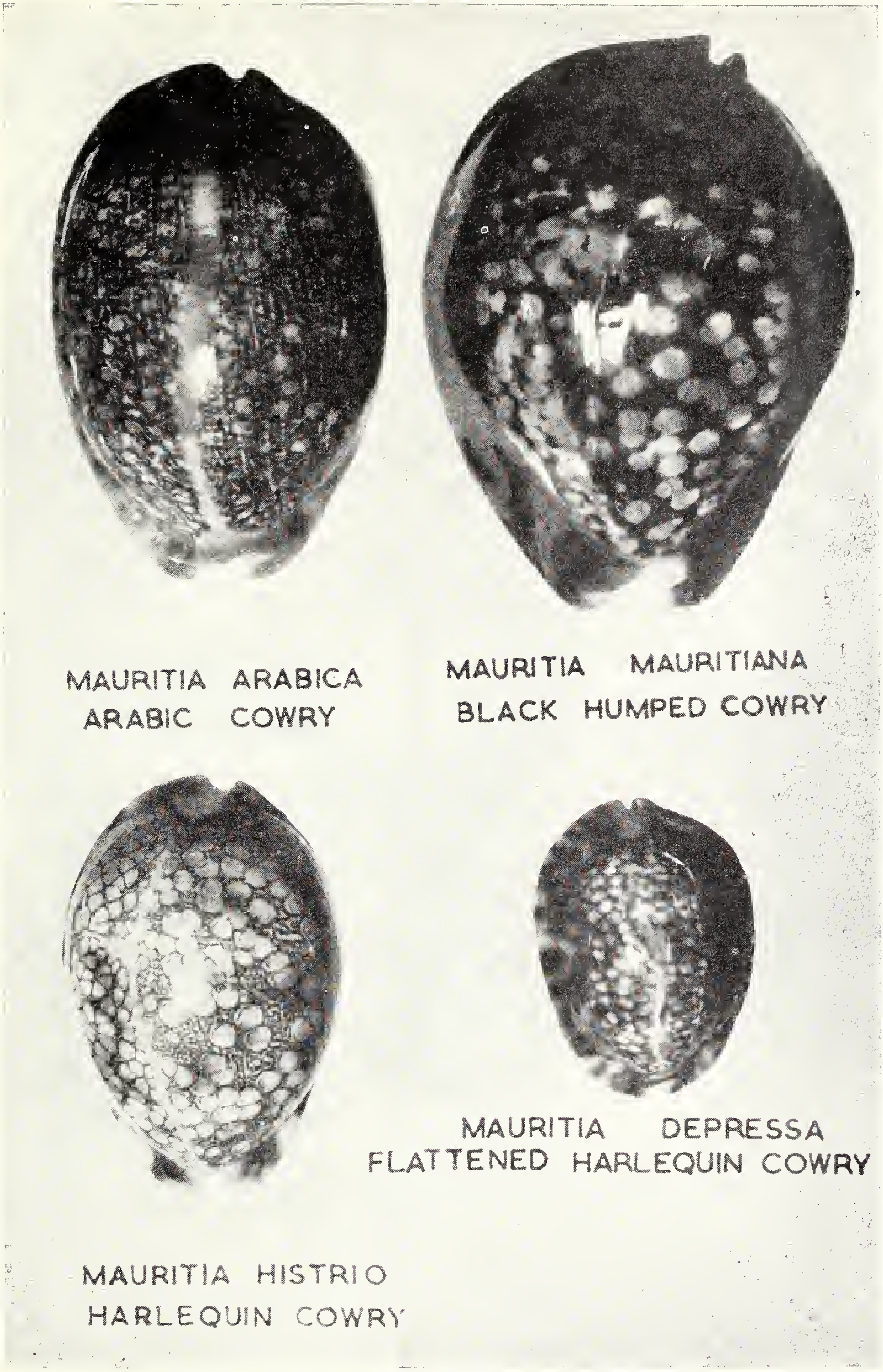


PLATE 11 *"East African Cowries (Natural Size)"*

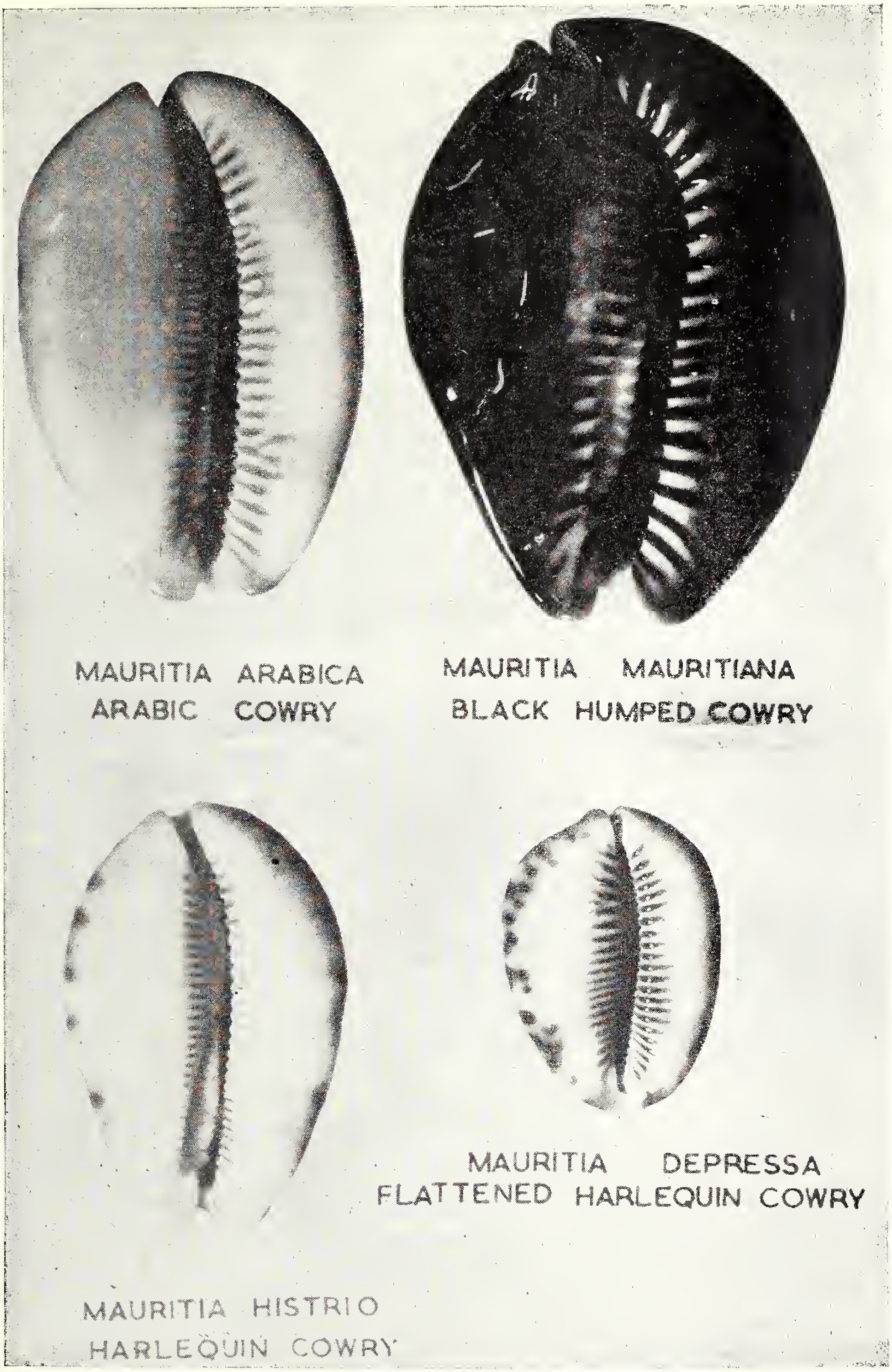


PLATE 12 "*East African Cowries (Natural Size)*"

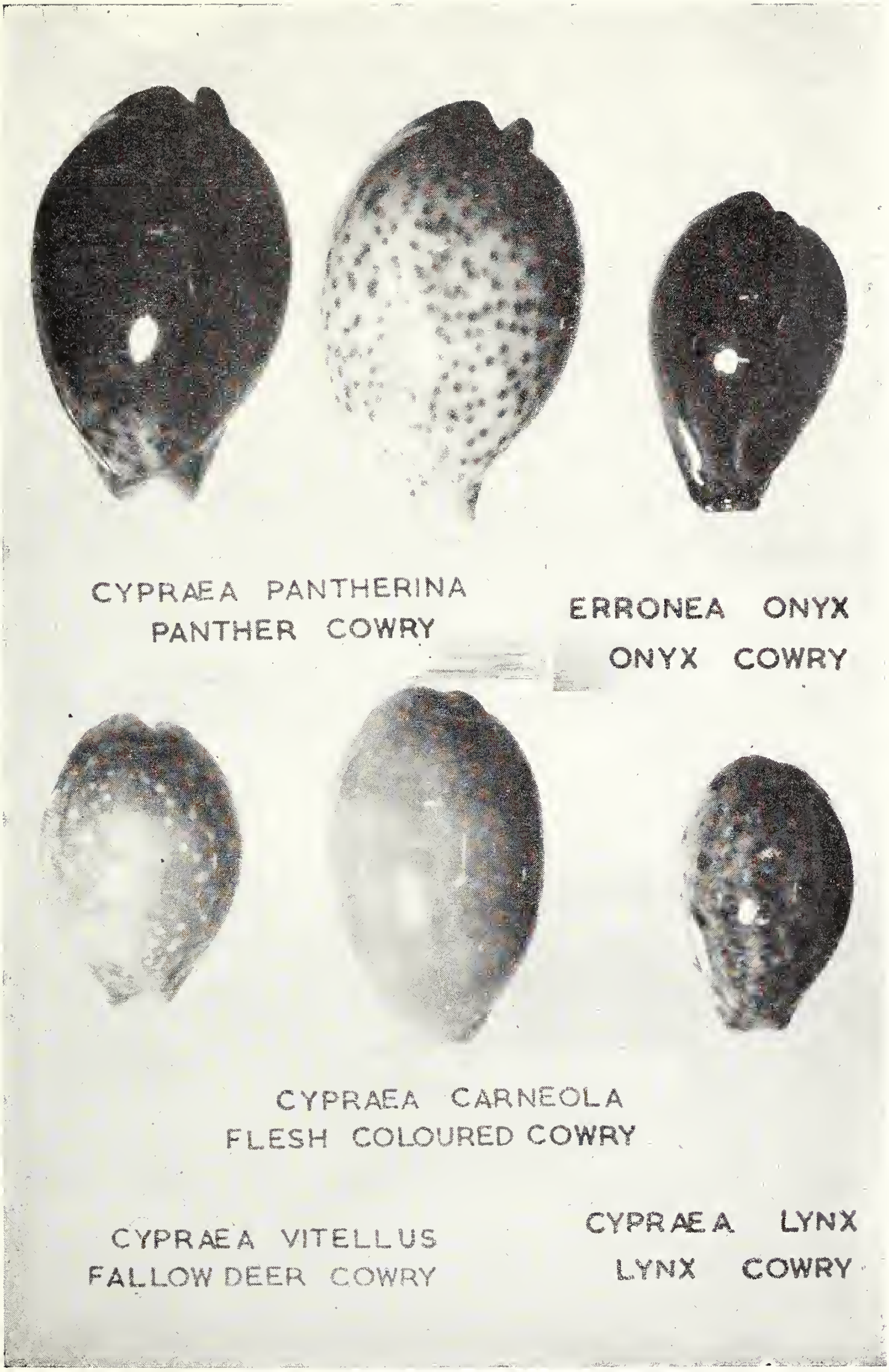


PLATE 13 "*East African Cowries (Natural Size)*"

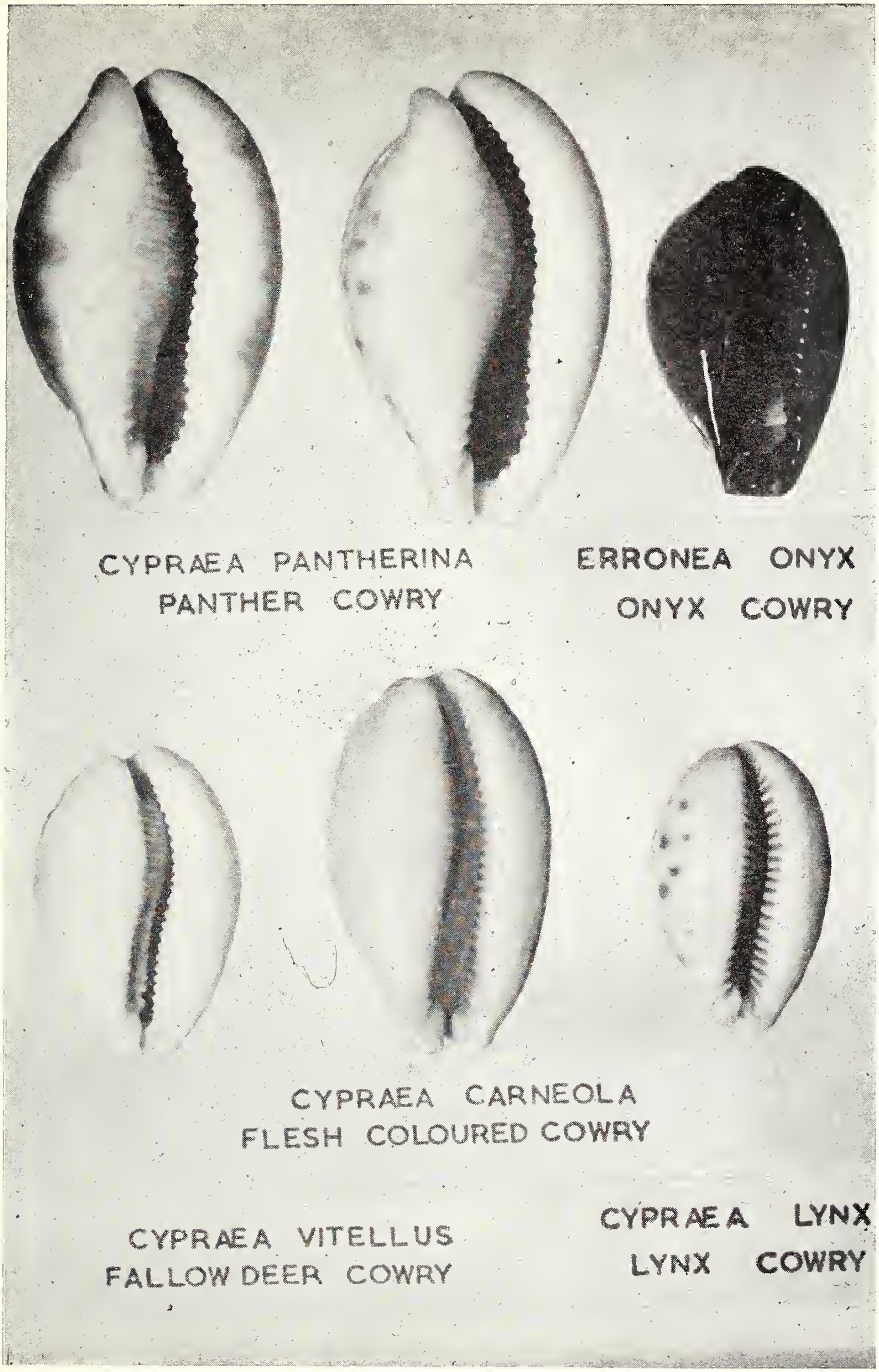


PLATE 14 "*East African Cowries (Natural Size)*"

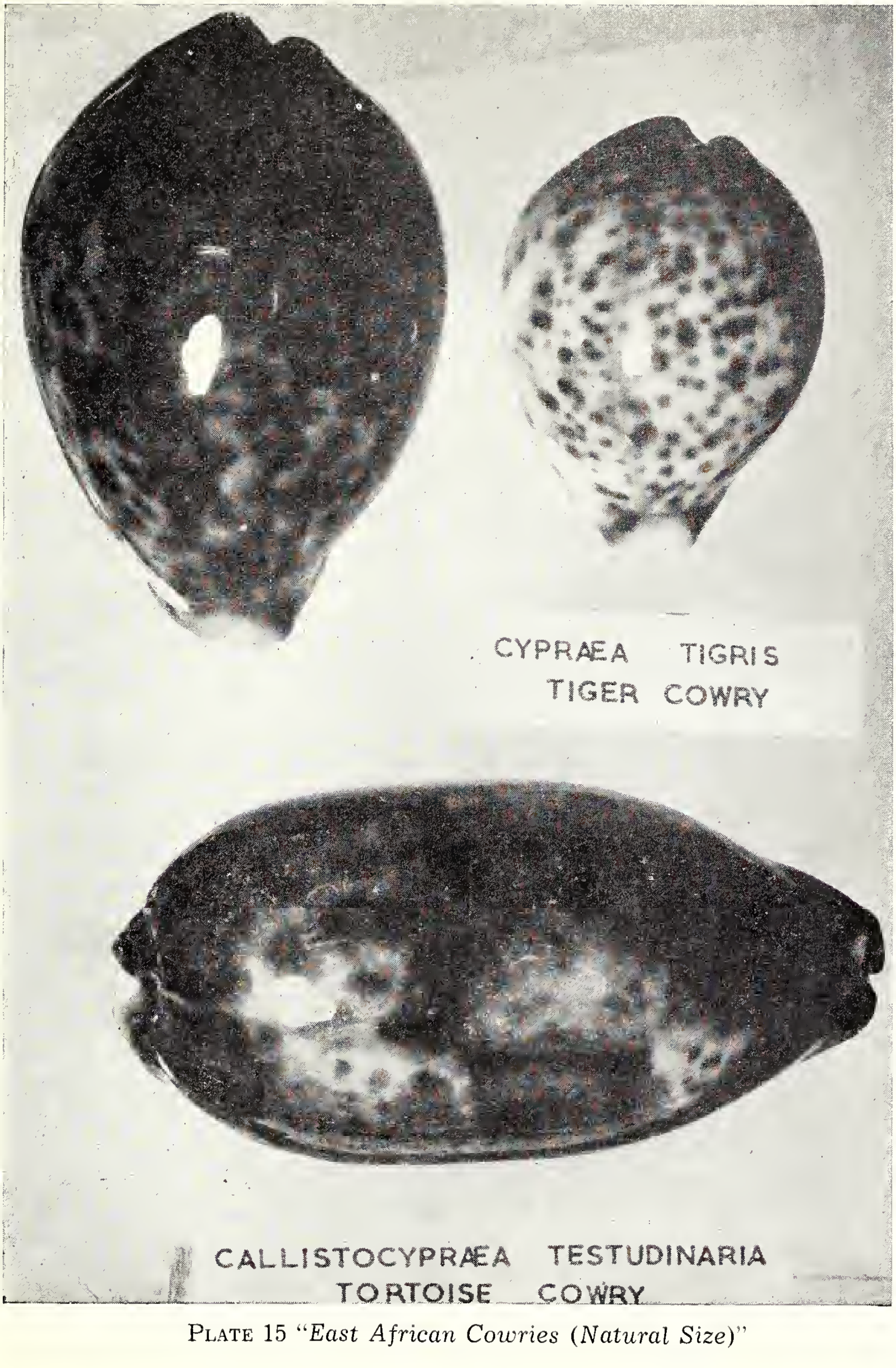


PLATE 15 "*East African Cowries (Natural Size)*"

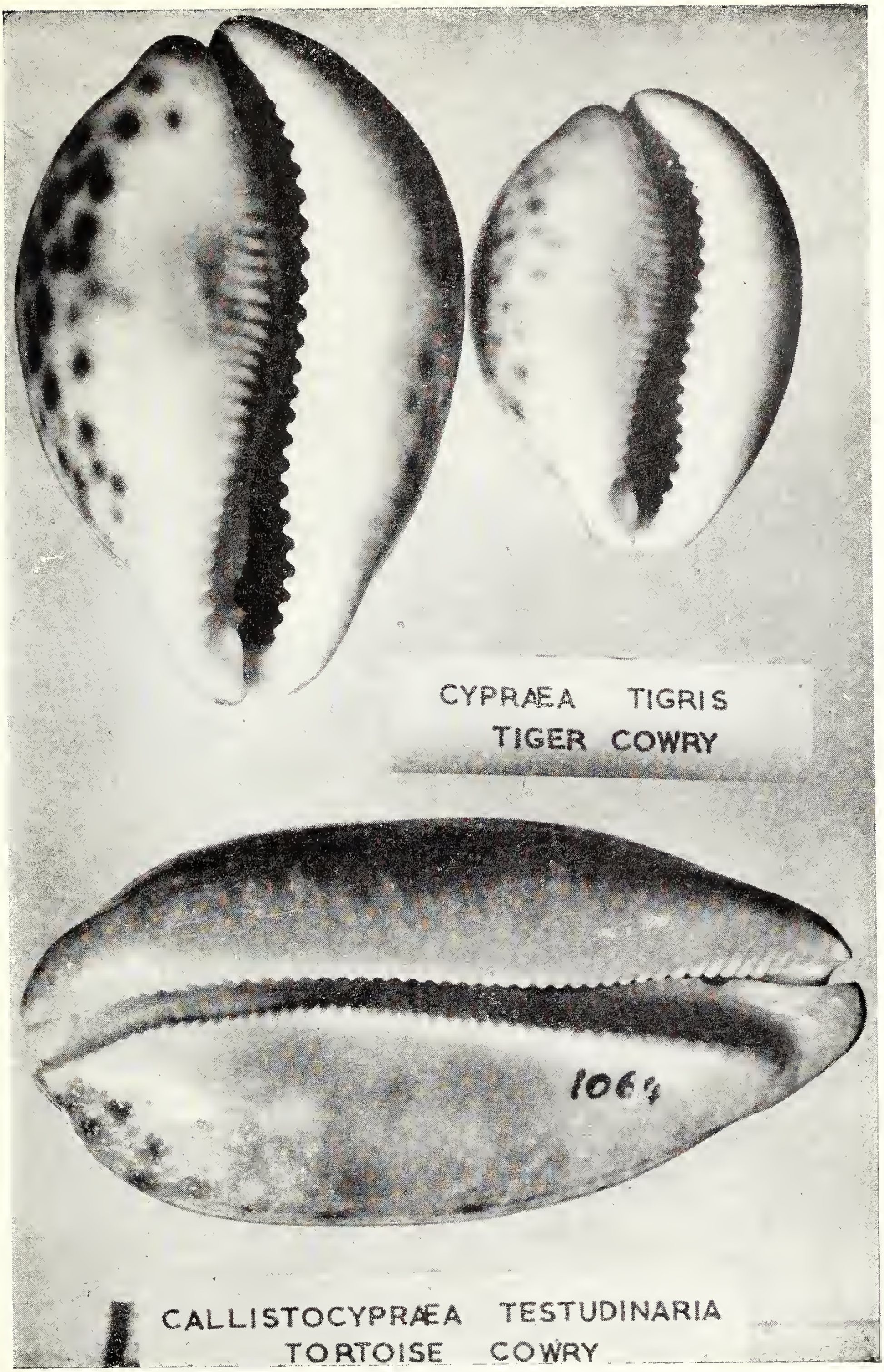


PLATE 16 "*East African Cowries (Natural Size)*"

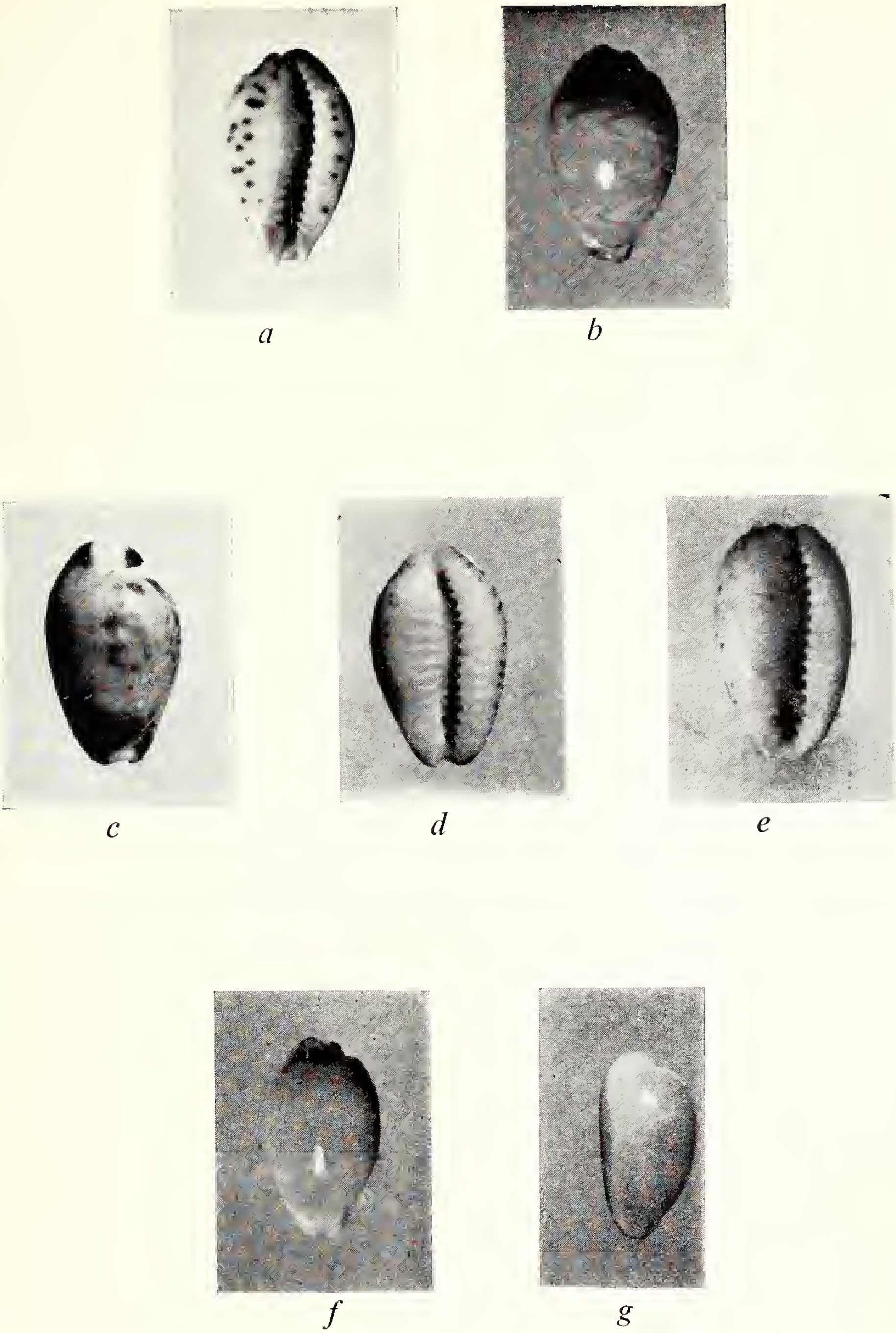


PLATE 17 "East African Cowries" (x 1.8)

a. *Palmadusta ziczac,* base.

b. *Palmadusta ziczac,* back.

c. *Blasicrura owenii,* back.

d. *Blasicrura owenii,* base.

e. *Blasicrura kieneri,* base.

f. *Palmadusta clandestina,* back.

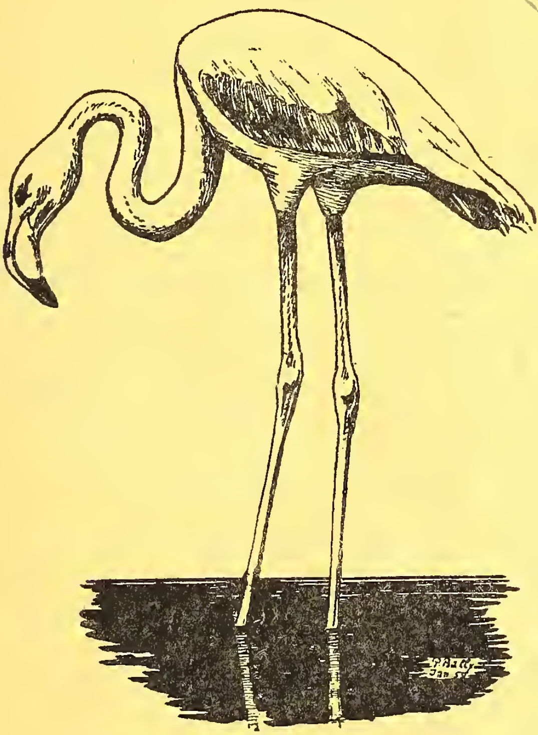
g. *Palmadusta clandestina,* side.

506.67

Journal
of the East Africa Natural History Society

MARCH, 1955 VOL. XXII NO. 5 (97)

SMITHSONIAN
FEB 23 195
LIBRARY



EAST AFRICA NATURAL HISTORY SOCIETY

PATRONS :

His Excellency The Hon. Sir Evelyn Baring, K.C.M.G., K.C.V.O.

Sir Philip Mitchell, K.C.M.G.

Sir Henry Moore, K.C.M.G.

PRESIDENT :

R. W. Rayner, Esq., B.A., A.I.C.T.A.

VICE-PRESIDENT :

H. Copley, Esq., O.B.E.

EXECUTIVE COMMITTEE :

P. R. O. Bally, Esq.

Colonel M. H. Cowie, M.L.C.

W. Hale, Esq., B.A.

J. S. Karmali, Esq., B.PHARM., PH.C., D.B.A.

Miss E. J. Blencowe, S.R.N., S.C.M.

J. McDonald, Esq., C.B.E., D.F.C.

P. J. Greenway, Esq., D.SC., O.B.E., F.L.S.

SECRETARY :

Miss D. Ewing

HON. EDITOR:

J. G. Williams, Esq., M.B.O.U.

HON. TREASURER :

W. R. Bowles, Esq.

HON. LIBRARIAN :

R. A. F. Brenan, Esq., M.A.

All correspondence in connection with this Journal should be addressed to :

The Hon. Secretary, P.O. Box 658, Nairobi.

Journal
of the East Africa Natural History Society

MARCH, 1955 VOL. XXII No. 5 (97)

Cover Design "Greater Flamingo" By P. R. O. Bally

CONTENTS

THE FOOD OF FLAMINGOES IN KENYA COLONY

By

M. W. Ridley, B.A., M.B.O.U., B. L. Moss, PH.D. and Lord Richard C. Percy, B.SC., F.Z.S.

CONTENTS

INTRODUCTION

Flamingoes are among the most numerous and important birds inhabiting the Rift Valley Lakes in Kenya (Fig. 1). The food supplies that can support such populations are therefore of special interest. The work that has been carried out on the ecology and bionomics of the lakes on which they live is well known. (E.g. Beadle, 1932; Jenkin, 1932; 1936.)

Lakes Hannington, Nakuru and Elmenteita are the lakes chiefly favoured by flamingoes. They are shallow and extremely alkaline, sodium carbonate being the main alkaline salt. They contain no fish (see Worthington, 1932). Lake Magadi, where soda deposits have been exploited commercially since 1919 (see Pulfrey, 1947), and Lakes Elmenteita and Nakuru contain the most alkaline waters and, being reasonably accessible, are famous for their flocks of flamingoes. Fish and higher plants are found in the fresher waters of Lakes Naivasha, Baringo and Rudolf, and flamingoes are relatively less numerous on these lakes.

Lakes Elmenteita and Nakuru show considerable fluctuations in level, Nakuru sometimes drying up completely. It was entirely dry for long periods during 1953, but as soon as any water collected after rain, flamingoes appeared in considerable numbers to feed. These two lakes are relatively small, with surface areas of approximately 7 and 14 square miles respectively, in comparison with Lake Naivasha (64 square miles) and Lake Rudolf. Lake Rudolf is much the largest lake of all, being some 185 miles long with a maximum width of 37 miles and a surface area of 2,923 square miles. Little is known concerning its flamingo population.

Of the two species of flamingo in Kenya (see Mackworth-Praed and Grant, 1952) by far the more numerous is the Lesser Flamingo *Phoeniconaias minor* (Geoffroy). Sometimes the population on Lake Hannington reaches a figure of about two million and in July 1953 this species formed over 99% of the total flamingo population on that lake. The Greater Flamingo *Phoenicopterus ruber roseus* Pallas also occurs in large numbers and it has been thought desirable to include the rather limited data obtained on this species as there is evidence that the two species have different diets although they are found in the same habitat.

MATERIAL AND METHODS

Owing to the peculiar structure of the beak and tongue, flamingoes are able to utilise very small organisms as food, consequently field examinations alone are of little use and a microscope is necessary to investigate fully the diet of these birds.

40 flamingoes were obtained of which 9 were greater flamingoes. 24 skins have been placed in the Hancock Museum, Newcastle upon Tyne.

In addition to field examinations, the contents of various portions of the alimentary canal of 29 specimens were preserved for subsequent laboratory examination in either 5% formalin or 70% methylated spirits (industrial). In the case of 5 of the lesser species and 4 of the greater, the entire alimentary canal from oesophagus to cloaca was also preserved. Samples of mud and water from the birds' feeding grounds were collected.

Preliminary investigations were carried out at Lake Elmenteita in November-December 1951 (see Ridley and Percy, 1953). Subsequently M. W. Ridley made expeditions to all the principal lakes in the Kenya Rift Valley. Specimens were obtained from most of these localities. The majority came from Lake Elmenteita in November-December 1951 and 1952, April and June 1953, and Lake Hannington in July 1953. Evidence was also obtained from Lakes Magadi and Naivasha in March 1953 and one bird was secured from Ferguson's Gulf, Lake Rudolf, in September 1953.

FIELD OBSERVATIONS

Both species of flamingo appear to feed during the greater part of the day although, in common with many birds in the tropics, they are most active at dawn and dusk. During the heat of the day the birds often sleep.

At dusk flamingoes become very active and fly around the lakes performing intricate manoeuvres and calling loudly. On Lake Elmenteita it is possible that some birds may flight away altogether, returning soon after dawn. If this is so, it can only be conjectural why or where they go. It is conceivable that they visit other lakes up or down the Rift Valley, either to drink, wash or roost. Lesser flamingoes are occasionally found dead in large numbers beneath telephone wires, particularly near Suswa in December 1952. This may be the result of their nocturnal wanderings or their migrations through Africa, about which very little is known. Some were also seen by Mr. P. R. O. Bally flying south at dawn at a great height over Lake Naivasha in July 1953 and their spasmodic occurrence on this lake points to a temporary resting place on these journeys.

On Lake Hannington, but nowhere else, lesser flamingoes were seen to drink at places where freshwater springs flowed into the lake and to flight considerable distances to do so. When drinking, flamingoes sip the water and then raise their heads vertically above their bodies to swallow it.

This is in contrast to their method of feeding which is to walk (or swim in deep water) slowly forwards only occasionally raising the head slightly above the horizontal. There is a noticeable difference in the behaviour of the two species when feeding although they are not necessarily segregated from each other in separate flocks.

The greater flamingo (Fig. 2) normally immerses the whole head in such a manner that the upper mandible is buried in the mud and the bird's head faces back towards its legs. Then, with a sideways motion of the head, not unlike a man scything, the bird moves forward at a slow but steady pace. Occasionally, about every 10 paces, the head is raised just above the surface with the neck bent for a few seconds presumably to breathe. Some birds in deep water "up-end" like ducks or swans but the majority feed in 1 to 2 feet of water and the young birds tend to feed closer to the shore than the adults. The legs of juveniles (Dec. 1951) which were about 10 months old were approximately 2/3 the length of those of the adults. Other greater flamingoes were seen to walk along the shore line apparently feeding on the beach drift.

The lesser flamingo (Fig. 3) seldom immerses the head but skims the surface of the water with only the upper mandible just below the surface. Generally they walk forward "scything" in the same way as the greater flamingo but sometimes they advance much more quickly with little or no sideways motion of the head. On occasions they may remain stationary, pivoting on the legs and swinging the head rapidly through 180 degrees. The majority feed in shallow water near the edge but some birds can usually be seen all over the centre of the lakes.

THE FOOD OF THE GREATER FLAMINGO

The diet of this species, which in India may even include small fish (see Ticehurst, 1923), has been the subject of much discussion. It is now clear (see Yeates, 1950) that the small numbers of birds examined from different localities throughout its range, which in the north stretches from Western Europe into Asia, make general conclusions of doubtful value. It must also be borne in mind that traces of organisms that are insignificant in a bird's diet are to be expected when the contents of the gut are studied in microscopic detail.

In Kenya (see Table 1), the birds do make use of the following food supplies :— chironomid larvae, copepods, corixids, seeds and higher plant fragments.

Chironomid larvae were detected without difficulty in the majority of birds examined and at Lake Elmenteita in 1951 they comprised the principal food of the specimens then secured. The larvae are selectively sifted from the mud.

The copepod *Paradiaptomus* (*Lovenula*) *africanus* (Daday) was also abundant both then and in 1952. Copepods were present in several birds and one specimen had been feeding exclusively upon them.

At times the following corixids are also abundant in Lake Elmenteita :— *Sigara* (*Vermicorixa*) *lateralis* Leach, *Micronecta scutellaris* Stal and *Micronecta bleckiana jenkinae* Hutch. These insects were found in some birds.

Both at Lake Elmenteita and Hannington seeds formed a small proportion of the food. Some of the seeds came from the Sedge *Cyperus laevigatus L.*, which is common on the edges of these lakes, but some were unidentified. McCann (1939) records similar seeds in India.

In addition various higher plant fragments that had fallen into the water consisting principally of cell walls, were found in the stomachs. They were specially noticeable in the two specimens taken from Lake Hannington. It is doubtful if much nourishment is derived from this type of material which appears similar to beach drift and in all probability it is mostly taken whilst the birds are straining animal food from the lakes.

In one individual from Lake Elmenteita, along with typical stomach contents, a significant quantity of blue-green algae and diatoms was found (see Table 1, No. 6.). Whilst the structure of the beak and mode of feeding are not specially adapted to straining minute organisms from water, the occasional presence of algae in significant quantities in the stomach is not surprising since it is frequently so abundant on the feeding grounds.

The authors (through the kindness of Col. Meinertzhagen and Lord William Percy), have been shown greater flamingo stomach contents taken at Port Sudan which consist of a pure mass of the gastropod *Tympanotomus fluviatilis* Potiez, a diet in essentials similar to the *Cerithium* diet recorded for the subsp. *ruber* in the New World (see Chapman, 1905). Chironomid larvae (see Salim Ali, 1945) and seeds have been recorded for India. In addition a crustacean diet has been mentioned for Egypt (see Meinertzhagen, 1930).

It is possible (see Gallet, 1950) that greater flamingoes may derive nourishment at times from simply swallowing mud rich in bacteria and decaying organic substances but no birds examined were feeding in this way.

THE FOOD OF THE LESSER FLAMINGO

Lesser flamingoes feed on algae (see Jenkin, 1929). During the present work a rich algal flora consisting of both blue-green algae (*Myxophyceae*) and diatoms (*Bacillariophyceae*) was found both in the stomach contents of lesser flamingo (Plate I) and in samples of lake water.

Sometimes, as in birds secured from Lake Naivasha (see Table 1, Nos. 25-27), the stomach contents resembled a rich culture of one diatom species only, *Navicula sphaerophora* (Kütz) Pfitzer, whereas other samples contained a large variety of species.

At Lake Magadi algae form a dense feltwork an inch or more in thickness around some parts of the shore, particularly near the entry of a hot spring. This feltwork consists mainly of filamentous blue-greens, *Oscillatoria* and *Phormidium* species together with colonial diatoms, all bound together in mucilage. Amongst the filaments were colonies of *Microcystis flos-aquae* (Wittr.) Kirchn., *Aphanocapsa elachista* W. & G.S. West and *Pleurocapsa* sp. Some filaments of *Spirulina subtilissima* (Kütz) were also present as well as a species of *Navicula*. A bird (see Table 1, No. 24) shot in 1953 on Lake Magadi contained exactly the same species although the filamentous forms had been broken up into short lengths.

Samples of mud and water collected from Lake Elmenteita also contained a variety of algae, though none of them in such profusion as in Lake Magadi. Collections made in 1952 included :— *Spirulina subtilissima*, *Oscillatoria terebriformis* Ag., *Chroococcus limneticus* Lemm., *Gyrosigma* sp. and a few specimens of *Coscinodiscus* sp. and *Cymbella* sp. The stomachs of birds collected while feeding on Lake Elmenteita in April and June 1953 (see Table 1, Nos. 15 and 16) contained the same diatom species and small fragments of the filamentous blue-greens.

Arthrospira platensis (Nordst) Gomont (Plate I, Fig. 8) was the dominant species from Lakes Hannington and Rudolf (see Table 1, Nos. 17-23 and 29), but on all occasions this alga was extremely rare on Lake Elmenteita, though it was originally here that the birds were observed feeding mainly on this species (see Rich, 1931: For the occurrence of this alga at Lake Rudolf, see Rich, 1933).

Whilst the algal diet of the lesser flamingo is the usual one and the one that clearly supports the vast populations of this species, it became clear from the first two birds collected that the specialisations of the beak which are peculiar to it, do not exclude it from taking other food. These two solitary birds, which had broken wings, were obtained on Lake Elmenteita in November 1951, when the great flocks of lesser flamingoes disappeared and there was very little algal growth in the lake. It was found that they had been feeding like the greater flamingoes on chironomid larvae, corixids and seeds (see Table 1, Nos. 9 and 10). Occasionally fragments of higher plants are taken in (see Table 2, Nos. 10, 16 and 24).

GENERAL REMARKS ON THE ALIMENTARY CANAL AND ITS CONTENTS

The alimentary canal of *Phoenicopterus* was studied by Gadow (see Gadow 1879). There is no significant difference between it and that of *Phoeniconaias* (Plate II) but the beaks of the two species are very different, the latter having a straining mechanism of much finer mesh. The nomenclature used in this paper follows that of Chalmers Mitchell (1901).

In an adult lesser flamingo, the length from pylorus to cloaca (the intestinal tract) measured over three metres. Most of this length is taken up by Meckel's tract. In all birds examined, the latter and the duodenum were packed in some regions with cestodes of the genus *Hymenolepis*.

Examinations of the oesophagus of some of the flamingoes studied immediately after death suggested that a relatively small but steady stream of food is passing down the oesophagus into the proventricular region of the stomach throughout the long periods during which the birds are feeding, though on one occasion a pure mass of unaltered chironomid larvae were found in the dilated portion of the oesophagus (which lies low down in the neck and is not a true crop), as though temporarily stored in this situation. Very little water appears to be taken in with the food.

The stomach consists of a glandular proventriculus and muscular gizzard with a hard internal lining. Grit was always found in the stomachs of the birds examined and the food is subjected to intense grinding (Plate I, Fig. 2). Some grit was also to be found in the intestinal tract and it therefore passes out with the faeces.

The size range of the grit from the stomachs of the two species from similar feeding grounds in Lake Elmenteita was found to differ (see Fig. 4), and this difference was also noted at Lake Hannington. In each case the particles were angular and somewhat rounded at the corners but as a whole the material is finer in the lesser species. It is inferred that this is due to the different straining mechanisms of the beak in the two species.

Reference to table 2 shows that diatoms are found in the intestinal tract of greater flamingo but this cannot be taken as evidence that they form a direct food supply of any importance to the species since it was found that diatoms frequently formed the bulk of the gut contents of the chironomid larvae on which they feed. In the main therefore, they may be regarded as the products of the break-down of previously ingested larger organisms. Attention has already been drawn to specimen No. 6 (see table 1). This bird does appear to have obtained both diatoms and blue-green algae direct in significant quantities.

The frustules of diatoms are resistant to digestion and traces of other food in the intestinal tract tend to be insignificant by comparison. Chitin from insects and the cell walls of higher plants were also found.

In contrast to the greater flamingo, reference to Tables 1 and 2 (see Nos. 11-29) shows that diatoms and blue-green algae are the significant elements in the food of the lesser species.

The authors are indebted to the East African Fisheries Research Organisation for pointing out to them that the diet of the lesser flamingo is very similar to some fishes (e.g. *Tilapia esculenta*) which in certain lakes feed largely on algae. G. R. Fish has established the remarkable fact, however (see Fish, 1951), that the blue-green algae which are frequently abundant pass through the *Tilapia's* gut undamaged.

The entire alimentary tract of three lesser flamingoes (see Tables 1 and 2, Nos. 16, 24 and 28), which had been feeding prior to death mainly on algae, were studied. In two of these specimens, traces of blue-green algae, although negligible, were present in the intestinal tract, together with, in all three, a great abundance of empty whole diatom frustules and fragments.

On the highly probable assumption that this material had previously been in the stomach in a condition similar to that actually found in stomachs (see Plate I), the observations recorded in this paper as a whole may be taken as showing that blue-green algae are digested together with diatoms and that the cell contents of the diatoms diffuse out even though the frustules are not necessarily broken (in Plate I compare Figs. 1, 2, 6 and 7 with Figs. 3, 4 and 5).

Whilst the material was clearly quite inadequate to state that all species of algae are digested, there was no evidence that any quantity of any species pass undamaged through the gut.

SUMMARY AND CONCLUSIONS

The lesser flamingo habitually feeds on algae in the alkaline lakes of the Kenya Rift Valley. The variety both of blue-green algae and diatoms found in the samples from the lakes, and the occurrence of the same species in the stomachs of the birds feeding there, suggests that they are able to utilise as food any microscopic phytoplankton available.

The food of the greater flamingo is variable. Small invertebrates are its principal food though some algae, seeds and fragments of higher plants are taken in. Unlike the lesser flamingo, no evidence was found that this species relies directly on the food resources of the phytoplankton.

ACKNOWLEDGMENTS

The authors would like to record their grateful thanks to those who were so helpful to them in Kenya, to Miss Penelope M. Jenkin for her kind advice and to the staffs of the Kenya Game Department, the Coryndon Museum, Nairobi, and the British Museum (Natural History). Thanks are also due to the Survey of Kenya for supplying data, to Mr. D. P. Graham for drawing the map, and to Mr. C. J. Duncan and the staff of the Department of Photography, King's College, University of Durham.

REFERENCES

Beadle, L. C. (1932). The waters of some East African lakes in relation to their fauna and flora. J. Linn. Soc. (Zool.) 38, 157-211.

Chalmers Mitchell, P. (1901). On the intestinal tract of birds, with remarks on the valuation and nomenclature of zoological characters. Trans. Linn. Soc. Lond. (Zool.) (2), 8, 173-276.

Chapman, F. M. (1905). A contribution to the life-history of the American flamingo. Bull. Amer. Mus. nat. Hist. 21, 53-77.

Fish, G. R. (1951). Digestion in *Tilapia esculenta*. Nature. 167, 900-901.

Gadow, H. (1879). Versuch einer vergleichenden Anatomie des. Verdauungssystem der Vögel. Jena. Z. Naturw. 13, 133-138.

Gallet, E. (1950). Flamingoes of the Camargue. Oxford: Blackwell.

Jenkin, P. M. (1929). Biology of lakes in Kenya. Nature. 124, 574.

Jenkin, P. M. (1932). Introductory account of the biological survey of five freshwater and alkaline lakes. Ann. Mag. Nat. Hist. (10), 9, 533-553.

Jenkin, P. M. (1936). Summary of the ecological results, with special reference to the alkaline lakes. Ann. Mag. Nat. Hist. (10), 18, 133-181.

Mackworth-Pread, C. W. and Grant, C. H. B. (1952). Birds of eastern and north eastern Africa. (1), 1, 80-83. London: Longmans, Green.
McCann, C. (1939). The Flamingo. J. Bombay nat. Hist. Soc. 41, 12-38.
Meinertzhagen, R. (1930). Nicoll's birds of Egypt. 2, 454. London: Hugh Rees.

Pulfrey, W. (1947). The geology and mineral resources of Kenya. Bull. Imp. Inst. Lond. 45, 289.

Rich, F. (1931). Notes on *Arthrospira platensis*. Rev. algol. 6, 75-79.
Rich, F. (1933). Scientific results of the Cambridge expedition to the East African lakes 1930-1-7. The Algae. Trans. Linn. Soc., (Zool) 38, 18-275.
Ridley, M. W. and Percy R. C. (1953). Notes on the birds of Lake Elmenteita, Kenya Colony. Proc. Univ. Durham phil. Soc. 12, 103-118.
Ridley, M. W. (1954). Observations on the dict of flamingoes. J. Bombay nat. Hist. Soc. 52, 5-7.

Salim Ali (1945). More about the flamingo (*Phoenicopterus ruber roseus* (Pallas)) in Kutch. J. Bombay Nat. Hist. Soc. 45, 586-593.

Ticehurst, C. B. (1923). The birds of Sind (part 5). Ibis. (11), 5, 439.

Worthington, E. B. (1932). The lakes of Kenya and Uganda. Geogr. J. 79, 275-97.

Yeates, G. K. (1950). Flamingo City. London: Country Life.

Zahl, P. A. (1953). Flamingo Hunt. London: Hammond, Hammond.

EXPLANATION OF THE PLATES

PLATE I

Samples from beak, stomach and intestinal tract of *Phoeniconaias minor* from Kenya lakes. 1 to 5 Naivasha, 6 and 7 Magadi, 8 Rudolf (Ferguson's Gulf).

1. *Navicula sphaerophora* from beak.
2. The same from gizzard. In two diatoms the cell contents are still intact. A piece of grit is shown near the top right-hand corner.
3. Grit and empty frustules from Meckel's tract.
4. Frustules from caecum.
5. Frustules and fragments from large intestine.
6. Filamentous blue-green algae from gizzard.
7. Part of 6, principally *Oscillatoria* sp. more highly magnified.
8. *Arthrospira platensis* from gizzard.

PLATE II

Stomach and intestinal tract of *Phoeniconaias minor*, slightly displaced to the right.

c., caecum. duo., duodenum. giz., gizzard
lint., large intestine. Mt., Meckel's tract
prov., proventriculus. t. testis.

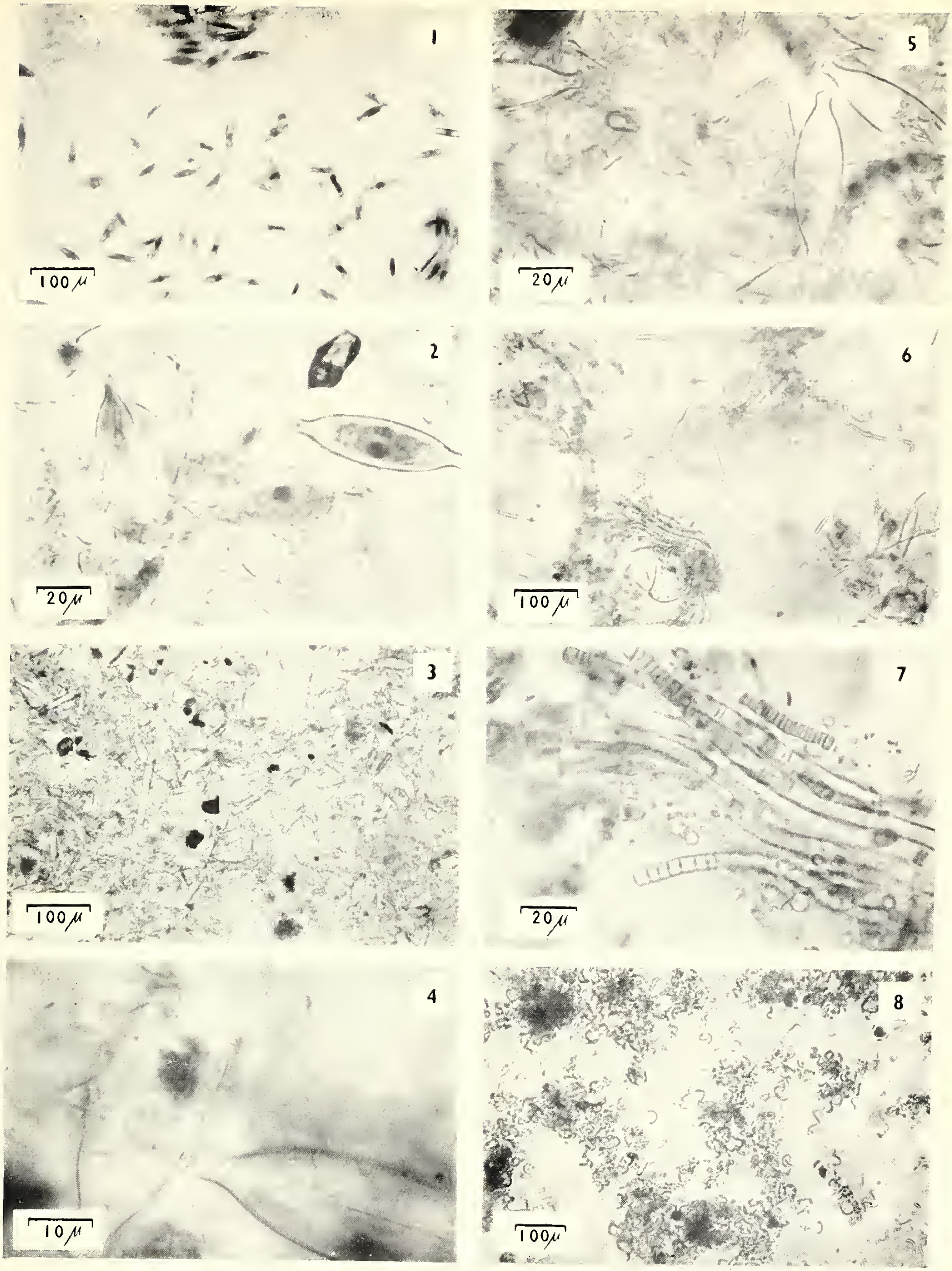
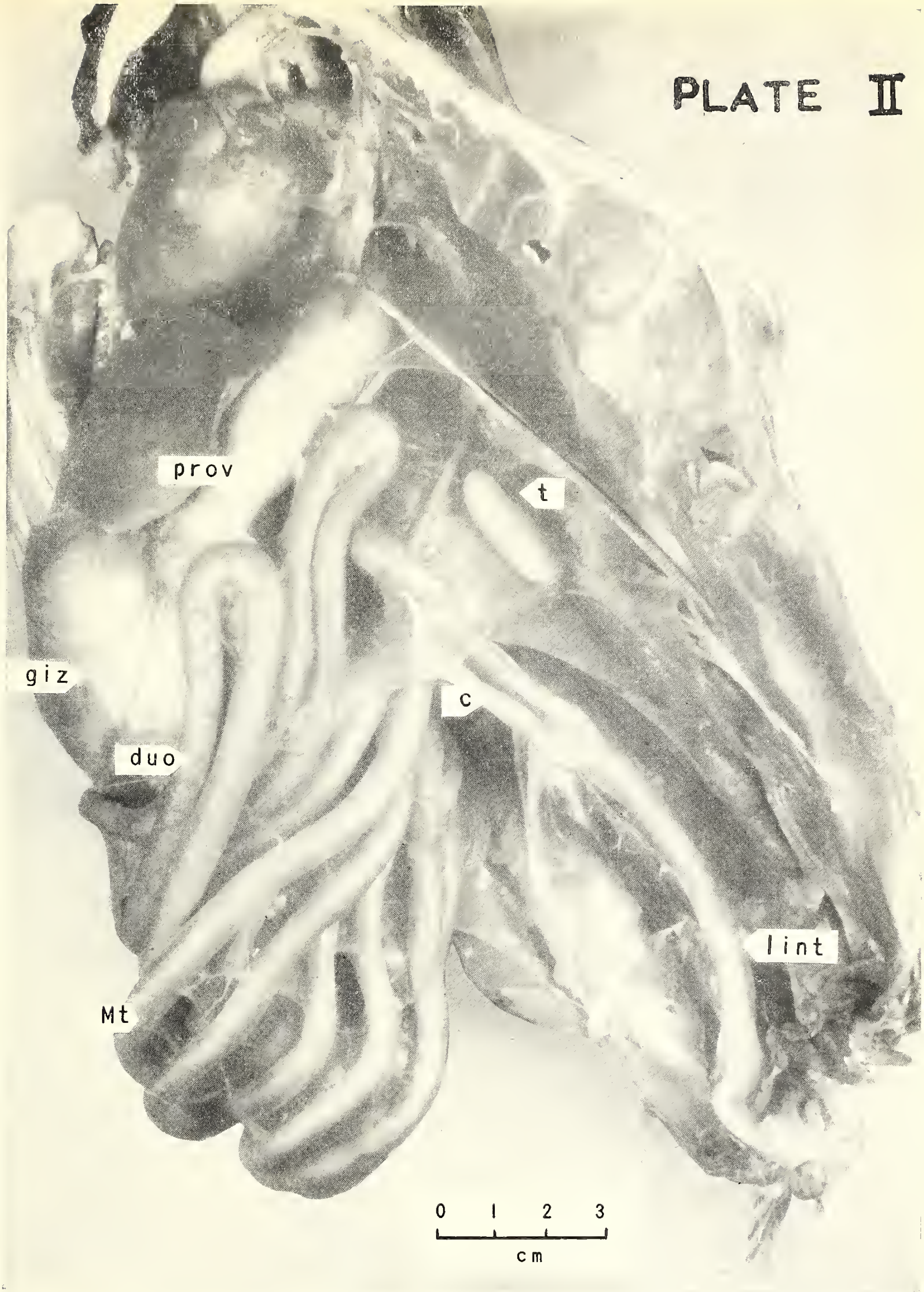


PLATE I

PLATE II



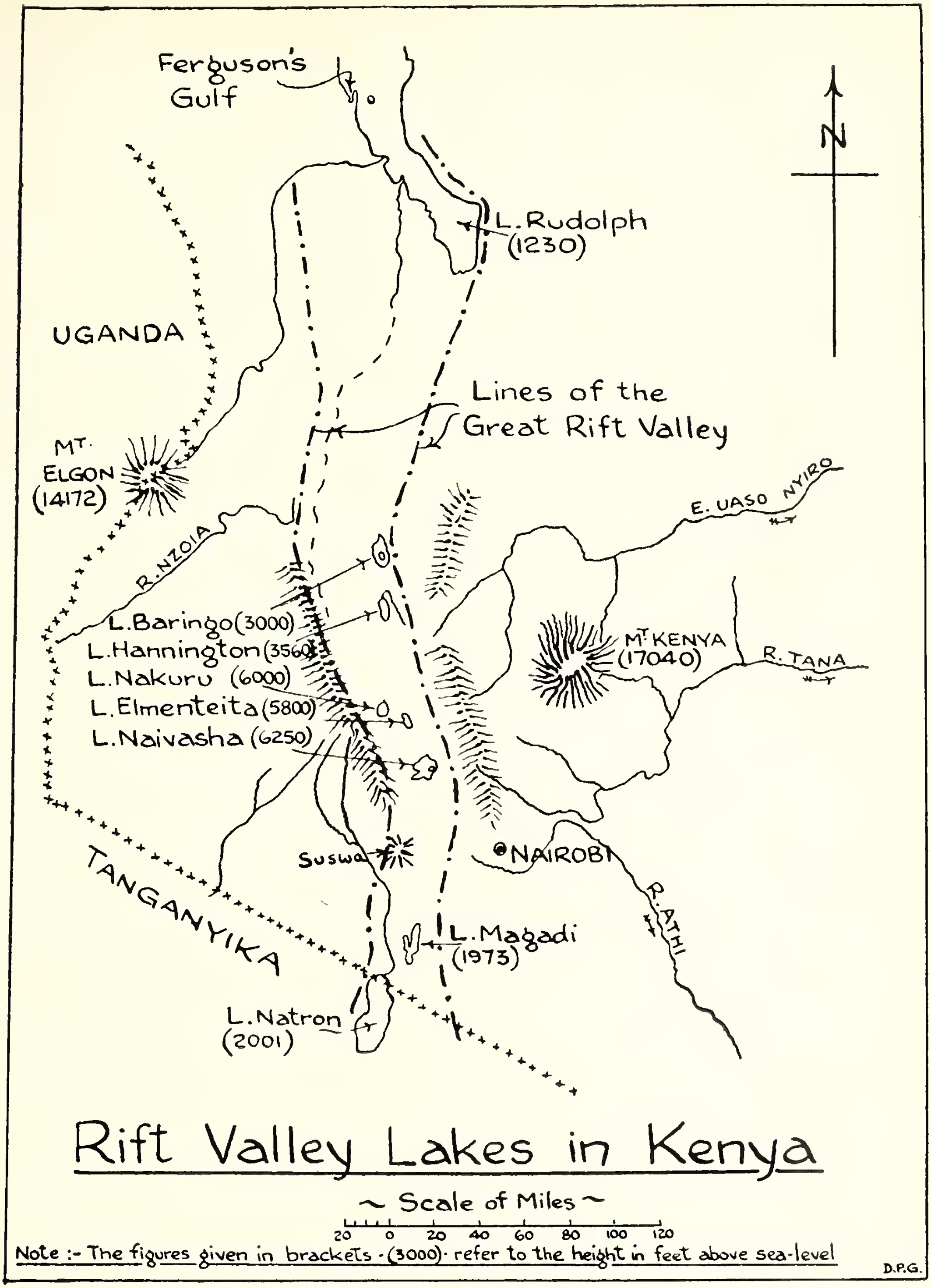


Fig. 1. Rift Valley Lakes.

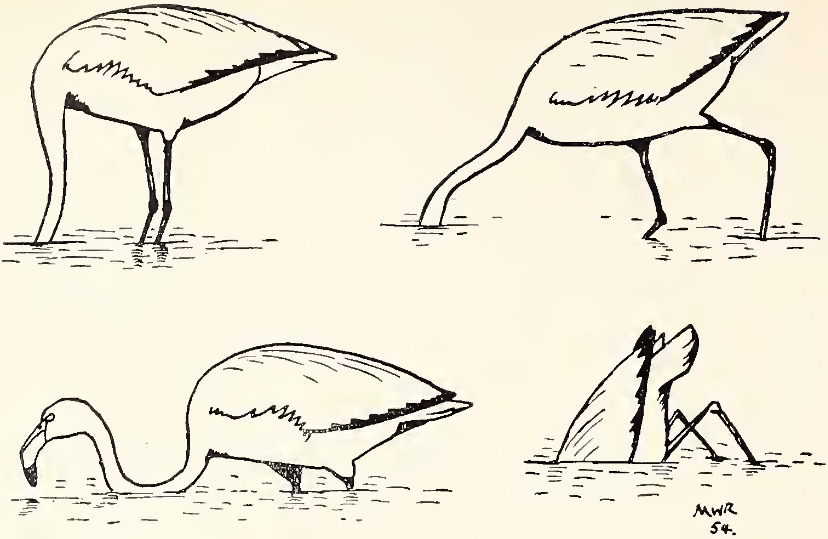


Fig. 2. Greater Flamingo feeding attitudes.

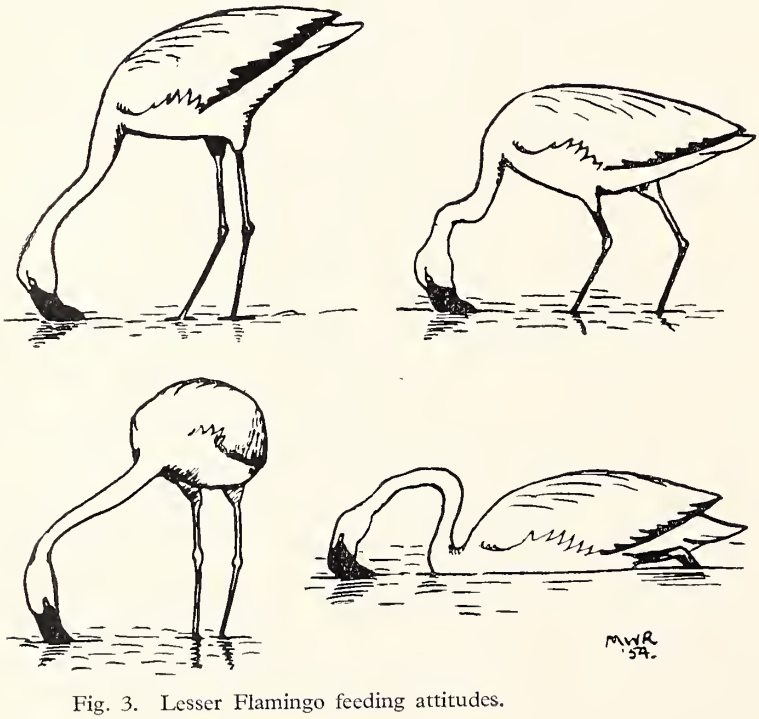


Fig. 3. Lesser Flamingo feeding attitudes.

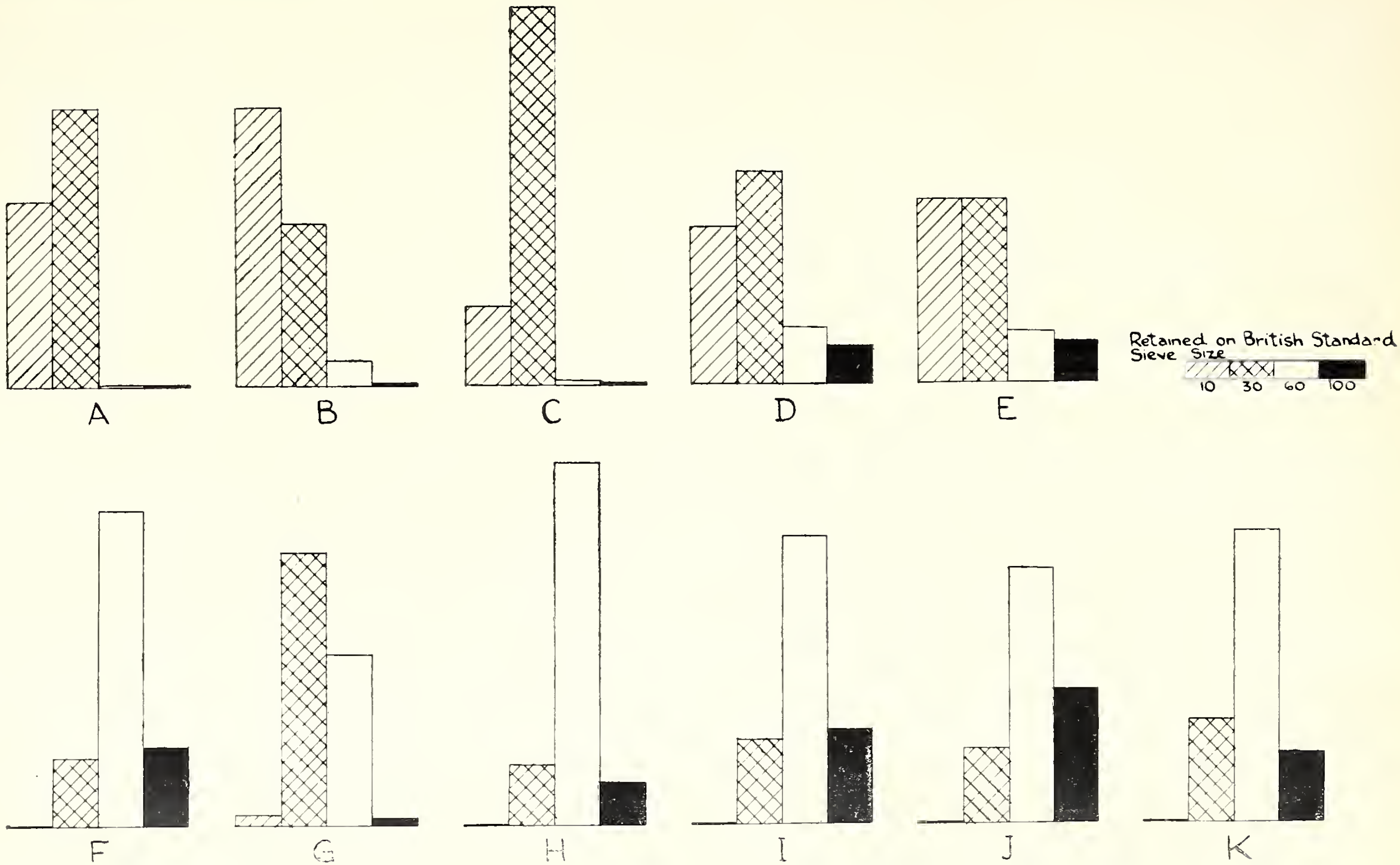


Fig. 4.—Histograms showing the approximate relative amounts by weight of various sizes of grit in the gizzards of eleven flamingoes from similar feeding grounds on Lake Elmenteita. The finer particles are not shown. A-E *Phoenicopterus ruber*, F-K *Phoeniconaias minor*. (By permission of University of Durham phil. Soc.)

TABLE 1

FOOD FOUND IN THE OESOPHAGUS AND STOMACH (proventriculus and gizzard) OF FLAMINGOES

A blue-green algae B diatoms C arthropods D higher plant remains

—, not examined microscopically

Where the amounts of A or B were insignificant, they are not shown

Locality and Specimen No.	*Date Collected*	*Oesophagus*				*Stomach*				*Special notes*
						Phoenicopterus ruber				
Elmenteita										
1	28.11.1951			C				C		Chironomid larvae abundant, also found on tongue. Corixids (trace). See table 2.
2	,,			C				C	D	Chironomid larvae and seeds.
3	2.12.1951							C		Chironomid larvae and copepods (trace). See table 2.
4	1.11.1952			C				C	D	Chironomid larvae, corixids (trace), copepods, seeds and higher plant fragments. See table 2.
5	14.12.1952	—	—	—	—			C		Copepods abundant, no traces of other food.
6	25.4.1953	—	—	—	—	A	B	C	D	Oil droplets. Chironomid larvae, corixids and traces of unidentified insects. Seeds and higher plant fragments.
Hannington										
7	17.7. 1953			C	D			C	D	Chironomid larvae and traces of other insects. Seeds and higher plant fragments abundant. See table 2.
8	,,	—	—	—	—			C	D	Higher plant fragments abundant.

Phoeniconaias minor

Elmenteita										
9	23.11.1951			C				C	D	Corixids abundant in oesophagus. Chironomid larvae and seeds in stomach. See table 2.
10	26.11.1951								D	Seeds. See table 2.
11	13.12.1952	A				A				
12	,,									Oil droplets in stomach.
13	,,	—	—	—	—	A				
14	14.12.1952					A				
15	25.4.1953	—	—	—	—	A	B			Oil droplets.
16	11.6.1953					A	B		D	Higher plant fragments. See table 2.
Hannington										
17	17.7.1953	A				A				Abundant in stomach. 1 species dominant.
18	,,	—	—	—	—	A				,, ,,
19	,,	A				A				,, ,,
20	18.7.1953	A				—	—	—	—	
21	,,	—	—	—	—	A				Abundant. 1 species dominant.
22	,,	A				—	—	—	—	
23	,,	—	—	—	—	A				Abundant. 1 species dominant.
Magadi										
24	29.3.1953	A	B			A	B			Abundant. See table 2.
Naivasha										
25	23.3.1953	—	—	—	—		B			Diatoms also found in beak, abundant. 1 species dominant.
26	,,	—	—	—	—		B			Abundant. 1 species dominant.
27	,,	—	—	—	—		B			,, ,,
28	,,									See table 2.
Rudolf										
29	8.9.1953	—	—	—	—	A				Abundant. 1 species dominant.

TABLE 2

FOOD REMAINS FOUND IN THE INTESTINAL TRACT OF FLAMINGOES

A. blue-green algae B. diatoms C. arthropods D. higher plant remains

§ abundant, ± present, ¶ present as trace.

Where the amounts of B were insignificant, they are not shown.

Species	Locality and Specimen No.	Date collected	*Duodenum*				*Meckel's tract*				*Caeca*				*Large intestine*			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Phoenicopterus ruber	Elmenteita 1	28.11.1951		±				±	¶	±								
	Elmenteita 3	2.12.1951						±				±	¶			±		
	Elmenteita 4	1.11.1952						±	¶	±		±	¶	±				
	Hannington 7	17.7.1953							¶	±								
Phoeniconaias minor	Elmenteita 9	23.11.1951						±										
	Elmenteita 10	26.11.1951			±	±		±		±								±
	Elmenteita 16	11.6.1951					¶	§							¶	§		§
	Magadi 24	29.3.1953					¶	§				§			¶			±
	Naivasha 28	23.3.1953						§				§				§		

THE BREEDING OF LESSER AND GREATER FLAMINGOES IN EAST AFRICA

By L. Brown

During 1953 Lake Hannington, situated 30 miles from Nakuru in the Rift Valley, supported an average population of approximately one million flamingoes of both species. The Lesser Flamingoes, *Phoeniconaias minor*, exceeded the Greater, *Phoenicopterus ruber*, throughout the year by 20 to 1. Observations at intervals between March and December 1953 showed that although about 4,500 nests altogether were built by *P. minor* no successful breeding actually took place at Lake Hannington. A total of five eggs were known to have been laid in a small colony but they were immediately knocked off the nests by their owners or trodden on. Even supposing, however, that all these 4,500 nests had reared young they obviously could not account for the enormous population of Lesser Flamingoes that exists. On Hannington this was estimated at between one and a half and two million by the writer in March 1953 and at two million by M. W. Ridley (in litt.) in July 1953.

Visiting Lake Hannington in June 1954 I found that this enormous population had practically disappeared. There were no more than 30,000 flamingoes on the lake altogether and there was no sign whatever of breeding activity. Following upon the good rains in April and May 1954 in the Rift Valley a considerable number of flamingoes appeared on Lakes Elmenteita and Nakuru (which had been dry in the 1953 drought) but the combined population on these lakes could not possibly account for the numbers which had left Lake Hannington. It was evident, therefore, that the great hordes of Lesser Flamingoes must have gone somewhere else, and it may have been to breed.

In an endeavour to ascertain the facts I made an aerial survey of lakes in Southern Kenya and Northern Tanganyika on 20th and 21st August, 1954. I was accompanied by P. R. O. Bally of the Coryndon Museum. The routes were as follows. On 20th August from Nairobi over Lake Magadi, the west shore of Lake Natron, the Embagai Crater Lake and Lake Manyara to Arusha. On 21st August from Arusha to Lakes Balangida Eidahan and Balangida Lelu near Mount Hanang, thence to Lake Eyasi and from there via Oldeani up the east side of Lake Natron back to Nairobi. The Embagai Crater Lake was visited as a note had appeared in 'Oryx' 2 (1953); 140, that flamingoes had been found breeding in this crater. It was not possible on this aerial survey to visit the Ngorongoro Crater on account of cloud.

The following were the results obtained from this survey.

Lake Magadi. A large number of adults, chiefly Lesser Flamingoes, but no signs of breeding.

Lake Natron. A very large breeding colony was discovered, described in detail in the subsequent paragraphs. There were possibly 500,000 adults of both species, chiefly Lesser, on various parts of the lake.

Lake Manyara. Large numbers of adult Lesser Flamingoes and some Greater but no signs of breeding.

Lake Balangida Eidahan and Balangida Lelu. Completely dry, no flamingoes.

Lake Eyasi. All practically dry except for a few patches of water, totalling several hundred acres in extent, on one of which there were about 4,000 Greater Flamingoes.

Embagai Crater Lake. A line of flamingoes all round the shore but no indication of breeding; the lake did not appear at all suitable since the shores are steeply shelving and not mud. There is another Embagai lake and the one visited, which is high on the Rift wall, may not be the one referred to in the note in 'Oryx'.

Part of the colony on Lake Natron was first viewed on 20th August at the southern end of the lake. There is a large expanse of water here caused by the inflow of stream and springs, which extends up the eastern and western shores in long narrow arms. About the middle there is a large dry tongue of soda-mud. Flying round the edge of this soda flat we saw large numbers of downy young Lesser Flamingoes. One group totalled about 1,000, with several smaller groups of 50 to 100 near them, about 1,500 all told in the water. Several other groups of young were visible on the soda flat itself. We flew in the direction of these herds of young birds for about a mile and there found a number of scattered nests in groups of two or three or even singles spaced widely apart in a manner unlike any flamingo breeding ground previously reported. We thought that the young we had seen must have come from these nests but in the light of later discoveries this may not have been so. The young in the water were accompanied by a few adults but it was evident that they had been largely left to themselves. They were about the size of a fowl and were covered in grey down. As we did not wish to remain long over Lake Natron on 20th August we flew on to Arusha, meaning to return the next day.

On 21st August we flew direct to the spot where we had seen the young birds; their numbers had increased considerably since the day before; the number in the water at the edge of the soda flat was now not less than 3,000. A small group had already attempted to cross the long arm of water running up the east side of the lake, presumably with the intention of reaching freshwater springs under Mount Gelai. The numbers in the water were being augmented rapidly from a string of groups and odd young birds which could be seen trekking across the soda flat from the north. This string extended for possibly two miles, with groups of youngsters along its length, and with isolated herds of young birds walking across the soda by themselves—an amazing sight.

Flying in the direction from whence the string of young birds came, we first passed over the scattered nests seen the day before, and a little further on located a very much larger colony of nests. This colony was roughly triangular, possibly a quarter of a mile long, and could not have contained less than 50,000 nests. It was a compact colony, but like the groups of nests built on Lake Hannington in 1953 it consisted of clumps and lines of nests with bare spaces between, rather than a continuous mass of nests. On Hannington the average density of nests in colonies built in 1953 was 1.4 per square yard, with groups of a density of 4.5 per square yard and bare spaces between; the Natron colonies did not seem quite so dense. All these nests were empty and it was assumed that they were the source of the young birds then trekking across the flats, although other herds of young had obviously gone to the water in other directions since we could see them standing in it.

About half a mile to the west of this great colony was a bay in the salt flat and here we came upon further large colonies at a much earlier stage. Most of these also had hatched young but the chicks varied greatly in size—from the size of a partridge to very small helpless creatures still in the nest. A large number of nests at the western extremity of this colony still contained newly-hatched chicks or eggs. My impression was that there was only one egg in each nest but owing to turbulence over the soda flat it was practically impossible to hold the binocculars still as the aircraft bumped and there may have been two lying close together. The chicks and eggs in the younger colonies were guarded by adults and it was evident that as soon as the young could walk they were taken to water. It was also evident that after a certain age the young were largely abandoned by their parents, since all those trekking across the soda flat were unaccompanied. One would have thought that such youngsters would be helpless against the attacks of birds of prey and this is probably the case for isolated individuals. One herd of chicks, however, over which we flew very low, ran together with their heads towards the centre and burrowed beneath the bodies of their companions, forming themselves into a compact knot in much the same way as a Rugby football scrum. This is presumably a defensive reaction against birds of prey.

At the western extremity of this huge colony of Lesser Flamingoes there were at least two colonies of Greater Flamingoes, each consisting of 50 to 100 pairs, with eggs or very small young. This is the first breeding record for the Greater Flamingo in East Africa. They were easily recognisable from above by the following characteristics :—

(a) larger size; (b) general paler pink colour; (c) the much more brilliant red in the wings when opened. It seemed probable that among the older, now deserted colonies, there had been a certain number of Greater Flamingoes' nests, since among the herds of Lesser Flamingo chicks there were generally some chicks which stood head and shoulders above the others, were clad in a much darker shade of down and looked as though they might be Greater Flamingoes.

There were a number of scavenging birds on the outskirts of this colony; they included several Ruppell's Griffons *Gyps ruppellii*, at least one pair of Tawny Eagles *Aquila rapax*, and a Lappet-faced Vulture *Torgos tracheliotus*. These birds were doubtless subsisting upon the dead or weakened adults and young which could be found scattered about in any colony of this sort. They were sitting very close to the flamingo colonies and their presence did not appear to be resented.

The total number of young, eggs, and occupied nests seen in all these colonies was estimated roughly at between 100,000 and 150,000. This may be an over-estimate owing to the difficulty of making a satisfactory count from a small bumping aircraft moving at 100 m.p.h., but it is based on considerable experience of estimating numbers at Lake Hannington. It is, at any rate, evident that a large part of the breeding flamingoes of East Africa were doing so on Lake Natron in August 1954, though by no means all the adults on the lake were breeding. M. W. Ridley (in litt.) told me that in 1953 he estimated the number of first-year immatures on Lake Hannington and other places as about 150,000 or more in a population of over two million. If this is a regular proportion of first-year young to adults it is likely that Lake Natron is one of the major breeding sites in East Africa, if not the most important.

Other points of interest in regard to this colony are as follow :—

(1) It is evident that the Lesser Flamingo breeds in much the same way as the Greater Flamingo, building a mud mound nest, 6-15 inches high and about 10-12 inches across the top, laying an egg in the depression on the top and hatching it in the normal way. Many eggs are found washed up on the shores of the Rift Valley lakes from time to time, and there were some about the shores of Natron on 4th September 1954, but it is evident that the flamingo does not simply drop its eggs on the shore and leave them to hatch (vide Grant and Mackworth Praed: Birds of Eastern and North Eastern Africa, p. 82, London 1952). These derelict eggs must either be washed off nests or dropped by the birds when visiting springs of fresh water.

(2) This colony would have been invisible from the shores of Lake Natron since it was at least three miles from the nearest shore below Mount Gelai. It would have been possible to walk right round the lake and be unaware of the colony's existence. Local Africans will say that flamingoes simply produce their young in the water. If this site on Lake Natron is regularly used, which seems probable, the first sight Africans would get of the young birds would be when they migrated to the freshwater springs running into the lake (which many of the young birds we saw were about to do). As this does not occur obviously until the young birds are about half grown the supposition that flamingoes produce their young out in the water of the lake would not be unreasonable on the part of a primitive African.

(3) The environment in which the young birds are produced is exceedingly harsh. Nests are doubtless constructed of wet slushy mud on the edge of this soda flat but the half-grown young were able to walk across several miles of solid soda which must have been at a high temperature and which was probably injurious to the skin of any ordinary animal. The concentration of salts in the water at the breeding place must also be great since Lake Natron is shallow everywhere and in large areas the red-brown algae dominate the blue-green which are the normal form in Lake Hannington. Any fresh water which the small young demand must, therefore, be provided by the parents which presumably go to the freshwater springs and collect it. The young are likely to need fresh water since immatures on Lake Hannington show a greater freshwater demand than adults.

(4) Mr. G. H. Swynnerton of the Tanganyika Game Department has kindly forwarded to me a report of flamingoes breeding on Lake Rukwa. This states that according to the local natives the adult birds became flightless when they had young and while helpless were caught in large numbers by Africans and used for food. In the Natron colony I saw no sign that the adults had become flightless and I also feel fairly certain that anybody attempting to run down a flamingo in water and mud would have a very poor chance. However, close acquaintance with a breeding colony is necessary before this point can be clarified.

(5) Egg laying had evidently continued for some time, since the oldest young were not less than 20 days old, and the latest nests still held eggs; laying probably continued for at least a month. I formed the general impression that the earliest nests might have been the scattered small groups, followed by the big triangular colony, and followed, as the water receded, by the other colonies in which small young or eggs were seen. The older nests were completely high and dry, but the newest colonies almost on the water's edge. There were, however, no visible nests in process of construction (such nests have a characteristic black appearance) and there seemed no likelihood of further egg-laying. Within the main colonies there had evidently been synchronisation of egg-laying in groups. There were many such groups or sub-colonies in which the young were all of almost exactly the same stage of development, indicating that 50-200 pairs had laid together on the same day or at least within a day or two.

Subsequent to this flight, on 22nd August, I walked round most of the western shore of Lake Elmenteita. In view of the exceptional numbers of flamingoes on the lake in 1954—more than I have ever seen on Elmenteita at any time since 1946—I thought it possible that there might be some signs of breeding. There were not less than 100,000 adult flamingoes of both species on the Lake, with many *P. ruber* among them, but no sign whatever of breeding and indeed most of the terrain is unsuitable being stony or rocky as opposed to muddy.

On 4th September 1954 I made an unsuccessful attempt to reach the Lake Natron colony on foot. The soda flat was separated from any accessible spot on the shore by a considerable expanse of water and I tried to cross one of these arms of water at a point I had marked from the aircraft as being approximately the narrowest. The water was very shallow overlying a soda crust, and I had nearly reached the far side when I became firmly stuck in the mud, with the result that large chunks of solid soda got inside my gumboots and I sustained severe soda burns of the feet which kept me in bed for three weeks. It is evident, therefore, that this colony will not be accessible without specialised equipment. It remains to be seen whether it is a regular breeding haunt and this will be best established from the air. Aerial photography might possibly be used to make an actual count of nests on another occasion. The birds with eggs or small young did not appear to be unduly disturbed by our aircraft, but birds standing in the water or accompanying herds of large young took wing very readily. It should be possible to avoid desertion of colonies caused by low-flying aircraft (as has apparently been known in the Camargue) if sufficient care is taken. East African flamingoes appear in any event to be much tamer and easier to approach than those of the Camargue.

THE COWRIES OF THE EAST AFRICAN COASTS

SUPPLEMENT 1

By Bernard Verdcourt

(East African Agriculture and Forestry Research Organisation)

Since the publication of my paper of this title (1954) two further species have been recorded and sufficient data are given here for them to be identified. Reprints of this note will be available for pasting into the back of the original pamphlet. Certain correspondents have intimated that they have data on the habits, animals and eggs of our species, subjects on which the author is woefully ignorant, and it is hoped that some of these people may be induced to publish their observations either in this journal or elsewhere.

Palmadusta gracilis (Gaskoin) subsp. *notata* (Gill).

Graceful Cowry. (Fig. 1, c and d.)

Description :— Shell pyriform or ovoid 1.6 cm. long and 0.9 cm. broad, back blue-green with very numerous pale brown dots and traces of two transverse bands reduced to some obscure grey-brown curved streaks. Margins cream, the right hand one suffused grey-brown with scattered dark-brown spots. Terminal spots purple-brown and ends blotched purple-brown below, base cream or yellowish. The animal is scarlet, matching the substratum on which it was found.

Kenya, Ras Ngomeni (S. Rawlins). Mr. Rawlins writes as follows: "Five or six specimens have been found . . . all at depths of about a foot below chart datum on the seaward side of the barrier reef which extends in a southerly direction for about 1,500 yards, commencing at the extremity of Ras Ngomeni. The molluscs were on a red coralline growth on the underside of coral boulders. The area is open to the full strength of the S. W. Monsoon and intercepts the permanent northerly coastal currents. It occurs together with *Mauritia mauritiana* and *Thais* spp."

This race is recorded by the Schilders from the Red Sea to the Gulf of Suez and Djibuti, the Persian Gulf and Mekran Coast.

Using the key and calling the base 'coloured' although it is only slightly tinged, it would key to couplet 32, *felina* and *kieneri*, both of which it resembles slightly. It differs from both in having the ends blotched purple-brown *beneath*. If the base was considered white, then it would key to 42 or 43, *felina* and *fimbriata*. *P. fimbriata* is its closest ally and has the purple blotching beneath the ends but *P. fimbriata* is a much narrower species, 1.25-1.4 cm. by 0.7-0.8 cm., with very much smaller and more obscure marginal spots. The two species were once rather confused.

Palmadusta punctata (Linn.)

Brown-spotted Cowry. (Fig. 1, a and b.)

Description :— Shell ovoid-pyriform 1.7 cm. long and 0.95 cm. wide, the lower end rather projecting. Back tinged with flesh colour, vaguely banded as in *P. clandestina*, covered with distinct fairly numerous brown spots. Terminal spots at each end rather larger and darker brown. The projecting lower end is margined and slightly orange-tinged. The base of the shell is whitish or faintly tinged, with the teeth and lower end very pale orange. Animal red.

Kenya, Malindi, on deep new reef in five feet of water at very low tide (J. M. Nightingale). Mombasa, Florida reef, opposite the golf course (R. S. Benton).

The nominate race is recorded by the Schilders from Mauritius to Natal, Seychelles, Chagos Archipelago and Gulf of Aden and is everywhere rare.

Using the key and assuming the base to be coloured, the teeth are very slightly darker than the rest of the base and it would key to couplet 24 but is very much smaller than any of the four succeeding species. If the base was considered white or tinged it would key to couplet 40, but differs from *E. turdus* in being a very much smaller shell with different coloration.

Cribraria teres and C. chinensis.
Both these species have red animals.

Fig. 1. (a) under side of *Palmadusta punctata*.
(b) upper side of ditto.
(c) upper side of *Palmadusta gracilis*.
(d) under side of ditto.

THE IDENTIFICATION OF KENYA BIRDS OF PREY IN FLIGHT PART 2, FALCONS, HOBBIES, KESTRELS AND PYGMY FALCON.

By JOHN G. WILLIAMS

The group of Birds of Prey dealt with in this paper, with the exception of the Pygmy Falcon, may be recognised in silhouette by their long, pointed wings and generally narrow, never forked, tails. (See Fig. 1.)

Fig. 1. Silhouette of falcon in flight.

African Peregrine Falcon.

Falco peregrinus perconfusus. COLL. and HART.

Adult. Crow-sized; throat whitish, contrasting with remainder underparts which are greyish buff with numerous transverse black markings; upperparts dark slate-grey, no chestnut or buff patch on crown.

Immature. Upperparts dark brown and no buff patch on crown; underparts buff, heavily streaked black.

The European Peregrine is an uncommon winter visitor to East Africa: it is larger and paler than the resident race. All races and plumages of the Peregrine differ from the Lanner Falcon in having dark crowns with no buff or chestnut patch.

Lanner Falcon.

Falco biarmicus biarmicus. TEMM.

Adult. Crow-sized; resembles Peregrine Falcon but underparts paler and white throat does not contrast with breast; upperparts much bluer and paler than Peregrine, with a conspicuous buff or chestnut patch on crown.

Immature. Like immature Peregrine but with buff crown patch. Two races of Lanner Falcon occur in Kenya, the South African nominate race in the south, with very few dark markings on the underparts, and the Abyssinian race in the Northern Frontier Province and Turkana, with heavily streaked underparts.

Teita Falcon.

Falco fasciiuncha. REICHW.

Adult. Large pigeon-sized; field appearance not unlike a small Lanner Falcon but with a distinctly short tail and more rufous underparts; rufous-buff patch on crown and nape conspicuous. The immature plumage is unknown.

European Hobby.

Falco subbuteo subbuteo. LINN.

Adult. Dove-sized; upperparts dark slate-grey, appears bluish in some lights; underparts pale buff, heavily streaked black. The African Hobby differs in having the underparts deep chestnut and the back bluish. Both species are extremely streamlined with long very pointed wings, and are very swift in flight.

Immature. Like adult but browner, less grey, above.

African Hobby.

Falco cuvieri. SMITH.

Adult. Dove-sized; not unlike European Hobby in build but underparts deep chestnut with black streaking not conspicuous in life and upperparts bluer.

Immature. Like adult but upperparts rather browner and more heavily streaked below, the streaking sometimes apparent in field, but not conspicuous as in the European Hobby.

Sooty Falcon.

Falco concolor. TEMM.

Adult. Pigeon-sized; plumage dark grey, not easily distinguishable in life from the less rare Grey Kestrel, but has central tail feathers longer than others, giving a wedge-shaped termination to the tail. Like the Grey Kestrel it is often crepuscular in its habits.

Immature. Like adult but with some buff and grey markings on underparts.

Eastern Red-footed Falcon.

Falco amurensis. RADDE.

Adult. Small dove-sized; generally gregarious, often seen with migrating flocks of Lesser Kestrels; male dark grey with conspicuous chestnut under tail-coverts and white undersides to wings; female has grey head, barred grey and black back and buff underparts streaked with black. Very kestrel-like in appearance and hovers like that species.

Immature. Closely resembles adult female.

Red-necked Falcon.

Falco chiquera ruficollis. SWAINS.

Adult. Dove or pigeon-sized; a thickset falcon with grey and black barred upperparts; crown and nape reddish-buff; underparts barred black and white. Not unlike a Lanner or Teita Falcon when seen at some angles, but immediately distinguished from those species when its black and white barred belly is seen. Often frequents localities where Borassus palms are growing.

Immature. Resembles adult but is browner above.

European Kestrel.

Falco tinnunculus tinnunculus. LINN.

Adult. Dove-sized; male has black spotted chestnut back, buff underparts with scattered spots and a black tipped, blue-grey tail. The male Lesser Kestrel has an unspotted chestnut back and is smaller. The female is dull rufous with indistinctly barred upperparts and spotted underparts; tail barred brown and black, sometimes tinged grey. The female Lesser Kestrel is smaller, not easy to distinguish in field, but is more gregarious in its habits. The White-eyed Kestrel has very bold barring on the upperparts and a grey rump and grey, black banded tail.

Immature. Closely resembles the adult female.

The resident East African Kestrel (*Falco tinnunculus carlo*) is a much darker bird than the northern nominate race. Kestrels observed between June and August may be identified safely as this race.

White-eyed Kestrel.

Falco rupicoloides arthuri. (GURNEY.)

Adult. Dove-sized; pale rufous in colour with conspicuous broad black barring on upperparts; rump blue-grey; tail blue-grey with black bands; sexes alike. The contrasting blue-grey rump and tail are the best field characters in flight to distinguish the White-eyed Kestrel from allied species.

Immature. Resembles adult.

Fox Kestrel.

Falco alopex. HEUGLIN.

Adult. Pigeon-sized; very long wings and tail; entire plumage, except flight feathers, rich chestnut-red with black streaks; sexes alike. In flight, in some lights, appears brilliant copper in colour. In Kenya found only in northern Turkana, where it frequents cliffs.

Immature. Resembles adult plumage.

Lesser Kestrel.

Falco naumanni naumanni. FLEISCH.

Adult. Small dove-sized; resembles European Kestrel, but more gregarious in habits, generally observed in flocks; male differs from European Kestrel by having unspotted chestnut back. Female closely resembles female European Kestrel but is smaller and undersides of wings and tail appear paler.

Immature. Closely resembles adult female.

Grey Kestrel.

Falco ardosiacus. BONN. and VIEIL.

Adult. Dove-sized; an entirely grey species; very like the Sooty Falcon but central tail feathers not longer than others. Often crepuscular in its habits and preys to some extent on bats, which it catches in flight.

Immature. Like adult, but rather browner in colour.

Dickinson's Kestrel.

Falco dickinson. SCLATER.

Adult. Dove-sized; plumage pale grey except for back and wings which are blackish; rump conspicuously pale when bird flies away from observer.

Immature. Like adult, but browner in colour.

Dickinson's Kestrel occurs mainly where Borassus palms are growing. It has not yet been collected in Kenya, but there are sight records of the species in the extreme south. It is quite a common bird on Pemba Island.

Pygmy Falcon.

Poliohierax semitorquatus castanonotus. (HEUGL.)

Adult. Shrike-sized; the smallest African bird of prey; occurs generally in acacia country. Field appearance more that of a shrike than a hawk; plumage grey above, white below with black and white wing and tail feathers; female has dark chestnut patch on back. Flight swift and undulating, the bird dropping when leaving perch.

Immature. Resembles adults but more buff in colour.

ON A SECOND COLLECTION OF REPTILES AND AMPHIBIANS TAKEN IN TANGANYIKA TERRITORY BY C. J. P. IONIDES, Esq.

By Arthur Loveridge

(Museum of Comparative Zoology, Cambridge, Massachusetts.)

CONTENTS

INTRODUCTION

When, four years ago, I published a report (1951a, pp. 177-204) on material taken by Mr. Ionides during the years 1947-1949, I remarked that, judging by the number of new fossorial species he had discovered, southeast Tanganyika was herpetologically the least known section of the Territory. The present paper deals with 1563 specimens, chiefly collected during 1950-1952, and submitted to me for study. As a result of Ionides' industry I think it might be fairly said that herpetologically the Southern Province is now among the best known areas of the country.

With characteristic generosity Mr. Ionides has donated some of this material to the British Museum, over 500 specimens to the Coryndon Memorial Museum, Nairobi, and the remainder to the Museum of Comparative Zoology at Harvard University. In the following pages these last are referred to by the letters M.C.Z. followed by their registration numbers which, of course, do not necessarily correspond to the total of any particular series as the balance has been sent to Nairobi. In cases where all of a series have gone to Nairobi, one or more of Ionides' field numbers, preceded by the letter "I", has been cited in order to identify it. For, with few exceptions, Ionides added greatly to the value of the collection by carefully tagging each individual with a serial number, locality, and date—thereby providing precise data as to breeding seasons and, to some extent, incidence.

However, it is as well to emphasise once again that deductions regarding the relative abundance of species in the area covered by this report cannot be made. This is on account of the collection submitted being selective, i.e. Ionides forwarded to me only those species in which he knew I was interested, principally forms whose variational range was inadequately known. The wealth of statistics that has resulted is too extensive to publish here, but has been entered on cards preserved in the Museum of Comparative Zoology where it is available for checking by interested students. Indeed, it is for the convenience of future investigators that the M.C.Z. numbers are here cited for specimens displaying unusual variations or exceptional measurements.

Generally only "records" or outstanding measurements are furnished, the total length being followed in parentheses by that of the head and body, then the tail, which, if truncated, has a plus sign added. Except for a very few, specifically mentioned, each of the 1,084 snakes, and almost every other specimen, has been measured and its scales counted. A considerable and tedious task where series range from 50 to 150 individuals. The more important results have been condensed into a few lines of print.

For convenience the localities from which material was obtained have been listed alphabetically in the text. They are :

Kilimarondo, Nachingwea District
Kilwa, Kilwa District
Kitessa Forest, Matengo Hills, Songea District
Lihuni, Liwale District
Lipumba, Matengo Hills at 3,900 feet, Songea District
Lindi, Lindi District
Liwale, recently incorporated in the Nachingwea District
Luhila, Songea District
Luhuu Juu, Liwale District
Lumesule River, rises on the northeast Tunduru/southwest Liwale border and empties into the Rovuma
Manyoni, Central Province
Masasi, Masasi District
Mbeya, Southern Highlands Province
Mbwemkuru, Liwale District
Mchangoni, Songea District
Miguruwe, Kilwa District
Mtepera, Kilwa District
Nachingwea, Nachingwea District includes the former Northern Masasi, northwestern Lindi, and all of Liwale District
Ngahama, Kilwa District
Rovuma River, forms frontier with Mozambique
Ruangwa River, Lindi District
Ruponda, Nachingwea District
Songea Boma, 3,800 feet, Songea District
Tunduru, Tunduru District

Following the locality the collecting dates are given with the month in roman numerals. I should like to invite the attention of East Africans to this method which I adopted thirty years ago so as to avoid ambiguity in this increasingly international era. When an English field collector writes 1.5.54 on a label he intends it to mean the first of May. When an American reads it, however, it is January 5th. Some American entomologists now write v.1.54 for 1st May, personally I think a better balance is achieved by placing the month in the centre as 1.v.54 and retaining the logical sequence of day, month and year. Occasionally the same date occurs on widely separated localities due to Ionides' African collectors being in different areas.

In this report only a single species is described as new, viz.

Ancylocranium ionidesi sp. nov.

a strange-looking, wedge-snouted, worm-lizard of which four examples were obtained in the Kilwa District. In 1953, however, I designated as paratype, a large and distinctive gecko (*Pachydactylus tetensis*) actually secured by Ionides on the Lumesule River, near Liwale, before I captured the type on the Zambezi River, near Tete, though the Tanganyika specimen did not reach me until long afterwards.

Other additions to the herpetofauna of Tanganyika Territory contained in the present collection are :—

Tetradactylus fitzsimonsi simplex (Laurent) of Congo
Typhlops tettensis tettensis (Peters) of Mozambique
Schistometopum gregorii (Boulenger) of Kenya Colony
Bufo anotis (Boulenger) of Southern Rhodesia

Not only is the serpentiform, whip-tailed lizard (*simplex*) also recorded here as a genus new to Tanganyika, but the species is new to Northern Rhodesia. The blind snake (*tettensis*) replaces a tentative identification of *T.t.* ? *obtusus* in the earlier Ionides' collection. The monotypic caecilian (*gregorii*), taken near the Ruvu River, has for the past sixty years been known only from the delta of the Tana River and vicinity. An earlier (1925) Tanganyika record of the earless toad (*anotis*) was based on an erroneous identification of mine, long since corrected.

Among other items of unusual interest I might mention the rediscovery after 40 years of what is apparently the second known example of a limbless skink (*Scolecoseps acontias*). The second Tanganyika record of an aquatic snake (*Lycodonomorphus r. whytii*); further examples of a recently described shovel-snout (*Prosymna pitmani*). The occurrence of four related species of centipede-eater (*Aparallactus*) at Liwale, raised a problem which is now unravelled—to facilitate recognition of the four species a synoptic key is provided. A study of the 150 night-adders (*Causus defilippii*) shows that the midbody scale-rows range from 13 to 17, not just 17 as has been thought for the past 90 years.

However, this report is not concerned merely with questions of taxonomy. Included are notes on breeding, diet, enemies, parasites, together with interesting observations on snakebite, native names, and other items which Mr. Ionides has kindly permitted me to extract from his letters.

REPTILIA

GEKKONIDAE

Hemidactylus mabouia (Jonnes)

♂ (I.1553) Liwale. 2.xi.49.

Preanofemoral pores of ♂, 47 (cf. Loveridge, 1947a, p. 167).

Ionides writes that at 10 a.m. on 17th November, at Mohamedi Makuliro's village of Mlembwe Juu, he observed a halfgrown House Gecko (*mabouia*) seized by the neck by a Two-striped Skink (*Mabuya s. striata*). A ten-minute contest ensued, during which, by a rapid succession of snaps, the skink improved its hold and the gecko apparently succumbed. The attack occurred on an unbarked, horizontal pole supporting the *banda* roof, and during the struggle the combatants moved along the pole, sometimes above, at others beneath it, until eventually they ended up on the roof outside. There, taking the gecko's head into its mouth, the skink gulped down its prey, the tip of the latter's tail disappearing about a quarter of an hour after the engorgement started. The skink (I.4306) was then caught and preserved with its meal intact.

Hemidactylus mercatorius Gray

♂, ♀♀ (M.C.Z. 52401) Liwale. 5.xi.49 & 23.vii.50.

Preanofemoral pores of ♂, 36. This name of Gray (1842) for a Madagascar gecko takes precedence over *gardineri* Boulenger (1909), described from Farquhar Island, and *persimilis* Barbour and Loveridge (1928c.) of Dar es Salaam. Gray's Palm Gecko was recovered from the stomach of a *Hemirhagerris n. nototaenia*.

Lygodactylus grotei grotei (Sternfeld)

4 ♂♂, 2 ♀♀ (M.C.Z. 52402-3) Kilwa. 9-25.viii.50.
♂ ♀ (M.C.Z. 52404-5) Liwale. 24.vii.& 27.ix.50.

Preanal pores in ♂♂, 4-7 (two have latter high number); on 27th September, the ♀ was gravid with eggs measuring 6 × 5.5 mm. Twenty-two other *grotei* collected at Liwale by Mr. Ionides were forwarded to the British Museum.

Lygodactylus picturatus picturatus (PETERS)

15 ♂♂, 3 ♀♀ (M.C.Z. 52406-7) Kilwa. 10.viii-30.x.50.
3 ♂♂, 1 ♀ (M.C.Z. 52408-9) Liwale. 10.ix.49-23.vii.50.

Preanal pores in ♂♂, 6-9 (7 have the higher number), average 8. One Painted Gecko was recovered from the stomach of a *Hemirhagerris n. nototaenia*.

Phelsuma dubia dubia (BOETTGER)

♂ (M.C.Z. 52410) Kilwa. 25.x.50.

Preanofemoral pores in ♂, 25. Owing to its habitat being in the crowns of coconut palms this Malagasy gecko is rarely collected, it has only been taken at four other localities along the Tanganyika littoral.

Pachydactylus bibronii turneri (GRAY)

2 ♂♂, 2 ♀♀ (M.C.Z. 52411-2) Kilwa. 26.viii-30.x.50.
♂, 4 ♀♀ (M.C.Z. 52413-4) Liwale. 14.vii.50.
juv. (M.C.Z. 52415) Tunduru. 6.xii.48.

Males lack pores. On 27th October, three ♀♀ held shell-less eggs almost ready for laying. The recognizable contents of half-a-dozen stomachs examined consisted chiefly of termites with an occasional beetle, but most of the food had been finely masticated by the powerful jaws of these big geckoes. Parasitic nematodes were numerous in the alimentary tract.

Eight additional *turneri* from Kilwa were sent to the British Museum.

Pachydactylus tetensis LOVERIDGE

♂ (M.C.Z. 51753) Lumesule River on Liwale border. 29.iii.48.

This is a paratype of a large and distinctive gecko related to *tuberculosus* (BOULENGER), characterized in part by the possession of from 12 to 13 preanal pores. In the original description I (1953e, p. 175) copied the different rendering (LUNGSOLE) of the label. Mr. Ionides, who adds this fine species to the herpetofauna of Tanganyika, informs me that Lumesule is the preferred spelling. The paratype was taken far up the river about two hours walk south of the Mbwemkuru River, at the same spot where five *Amblyodipsas* have been taken on various occasions.

AGAMIDAE

Agama cyanogaster (RUPPELL)

♂ (M.C.Z. 52416) Kilwa. x-xi.50
2 ♂♂ (M.C.Z. 52417) Liwale. 1948-49.

Preanal pores in two rows of 10 above 10, totalling 20.

Agama mossambica mossambica PETERS

juv. ♀ (M.C.Z. 52418) Lindi. 1.v.49.
15 ♂♂, 11 ♀♀ (M.C.Z. 52419-20) Liwale. 2-20.xi.49.
3 ♀♀ (M.C.Z. 52421) Tunduru. 1949.

A dusky network is present on the throats of some ♀♀ and all ♂♂, but, in addition, the throats of adult ♂♂ are pale blue with a dark blue basal patch.

Mr. Ionides (20.xi.51) points out that in my (1951a, p. 179) previous report on reptiles received from him, in referring to *mossambica* ♀♀ being gravid at Liwale in mid-December I should have said "towards the beginning (not end) of the rains". In 1949, the year in question, the rains at Tunduru commenced on 23rd December, though normally they start in mid-December and end about mid-April.

From Ruponda Mr. Ionides forwards the following observation which we both think refers to this agama. On 4th April, 1950, Mr. B. D. Nicholson of the Game Department was sitting in his tent when he saw a bush squirrel (*Paraxerus flavivittis exgeanus*) chase a six-inch lizard up a tree. The lizard endeavoured to dodge its pursuer, but the squirrel had it in a flash. So quickly, in fact, that the observer failed to note whether the lizard was caught by the squirrel's claws or seized in its jaws. All but the head was eaten. A ♀ *mossambica* was found in the stomach of a Tiger Snake (*Telescopus s. semiannulatus*) by Ionides on 8.v.50.

CHAMAELEONIDAE

Chamaeleo dilepis dilepis Leach

Ionides (7.ii.50) reports that the Common Flap-necked Chameleon is known as *kinyonga* to the Ngindo. As food for some Boomslangs (*Dispholidus typus*) he placed a large chameleon in their cage, and at intervals of about half-an-hour introduced two geckoes for the Hissing Sand Snakes (*Psammophis s. sibilans*). As each gecko, approximately five inches in length by two-and-a-half inches in girth, was put into the cage, the chameleon promptly caught and ate it. In due course the chameleon itself was seized and swallowed by a Boomslang. See remarks also under *Thelotornis k. capensis* and *Dispholidus typus*.

Brookesia brachyura ionidesi Loveridge

Brookesia ionidesi Loveridge, 1951a, Bull. Mus. Comp. Zool., **106**, p. 179: Kilwa, Southern Province, Tanganyika Territory.

♂ (M.C.Z. 52422)	Liwale. 21.iv.50.
♀ (M.C.Z. 52423)	Luhila, Songea. x.50.

Since describing this pigmy chameleon I have been able to examine the type and fresh Nyasaland material of *brachyura* (Gunther), of which Ionides' Short-tailed Chameleon is clearly a northern race. In the key to all African *Brookesia* which accompanied the description of *ionidesi*, the southern Tanganyika reptiles referred to as *brachyura* were actually an undescribed species which I (1953e, p. 190) have since named *nchisiensis*. Kilwa paratypes of *B. b. ionidesi* have been presented to the Coryndon Museum by Mr. Ionides.

Ionides writes (20.ii.50) that these *Brookesia* are very hard to find during the dry season. Towards the end of January through February, however, they appear to gather around the whitish fruit of a tree called *mikwambi*, or may be found on *mbazi*. [Possibly the fruit attracts small flies or other insects ? A.L.] They are known as *kitoga* in Ngindo, and *kipande* by the Yao.

Some idea of their diminutive size may be obtained from the fact that the above-listed ♂ measures 45 (37 + 7) mm., the gravid ♀ only 51 (43 + 8) mm., though in October the developing ova were still small.

SCINCIDAE

Mabuya quinquetaeniata margaritifer (Peters)

40 (M.C.Z. 52424-39)	Kilwa.	19.vii-30.x.50.
3 (M.C.Z. 52440)	Liwale.	7-21.vii.50.
2 (M.C.Z. 52441)	Masasi.	5.ix.50.

Midbody scale-rows 42-46, average 42.8 for the 45 skinks. This means that they are referable to the South African race *margaritifer*, described from Tete (27 topotypes average 42.2 midbody scale-rows) instead of to the Tanganyika (and Nyasaland) race as one might have supposed!

Largest ♂ (M.C.Z. 52424), 228 (110 + 118) mm., largest perfect ♀ (M.C.Z. 52430), 222 (93 + 129) mm., but surpassed by a tailless ♀ with a snout to anus length of 101 mm. In October ova are small in all Kilwa ♀♀. The bright blue tail of a young specimen was present in the oesophagus of a large adult.

Mabuya maculilabris comorensis (PETERS)
♂♂, ♀ (M.C.Z. 52442-3) Kilwa. 17-23.viii.50.

Midbody scale-rows 32-34. Larger ♂, 239 (82 + 157) mm.; ♀ 207 + (80 + 127 +) mm. This ♀, taken on 17th August, held spherical ova measuring 17 mm.

Mabuya maculilabris boulengeri STERNFELD
♂, 2 ♀♀, juv. (M.C.Z. 52444-5) Kilwa. 8.viii-31.x.50.

Midbody scale-rows 30. Length of ♂, 214 + (92 + 122 +) mm.; larger ♀, 216 (90 + 126) mm. The latter, taken on 31st October, held six eggs measuring about 14 × 10 mm.

Mabuya planifrons (PETERS)
♂ ♀ (M.C.Z. 52446) Kilwa. 10-13.viii.50.
♀, juv. (M.C.Z. 52447) Liwale. 11.xi.49-7.x.50.

Midbody scale-rows 30. Larger ♀, 330 (116 + 214) mm.

Mabuya striata striata (PETERS)
♂♂, juv. (M.C.Z. 52448) Kilwa. 11-12.viii.50.
♂♂, ♀, juv. (M.C.Z. 52449) Liwale. 7.xi.49-2.iv.50.

The subocular fails to reach the lip on the right side of M.C.Z. 52449; midbody scale-rows 33-34. Largest ♂ (C.M.), 230 (101 + 129) mm. The ♀ taken on 2nd April, holds eight eggs containing small embryos. A caterpillar, cockroach, grasshopper, spider and vast numbers of termites were present in the two stomachs examined. One skink was observed seizing and swallowing a halfgrown gecko, *Hemidactylus mabouia*, which see. The Common Two-striped Skink is known as *kiulumdwa*, *fide* Ionides.

Mabuya varia varia (PETERS)
♀♀ (M.C.Z. 52450) Kilwa. 13-17.x.50.
♀ (M.C.Z. 52451) Kitesa Forest, Matengo Highlands, Songea. 28.v.50.
20 (M.C.Z. 52452-9) Liwale. 13.vii-9.x.50.

Midbody scale-rows 30-32 (but only ten of the Liwale series were counted). Largest perfect ♂ only 144 (48 + 96) mm.; largest ♀ (M.C.Z. 52451), 144 + (69 + 75 +) mm., but tail regenerating. The following data was derived from breeding ♀♀ examined.

28th May	held very small ova (at Kitesa).
13th July	„ 6 eggs measuring about 5 × 5 mm.
23rd July	„ fully scaled and pigmented embryos.
7th Oct.	„ 5 eggs ca. 7 × 8 mm., containing colorless embryos.
7th Oct.	„ 7 eggs ca. 7 × 8 mm., containing colorless embryos.
8th Oct.	„ 7 eggs ca. 5 × 5 mm., without embryos.
8th Oct.	„ 5 eggs (irregular) containing minute embryos.
9th Oct.	„ 7 eggs ca. 7 × 7 mm., without embryos.
13th Oct.	„ very small ova (at Kilwa).
17th Oct.	„ very small ova (at Kilwa).

Ablepharus wahlbergii (A. SMITH)
25 (M.C.Z. 52460-6) Kilwa. 21.viii-1.xi.50.
7 (M.C.Z. 52467) Liwale. 21.vii-5.x.50.

Midbody scale-rows 22-26; lamellae beneath fourth toe 13-17 (but counts were made on only seven skinks from each locality). Largest perfect ♂ (I. 2451), 88 (40 + 48) mm., and ♀ (I. 2634), 90 (40 + 50) mm.

On both 21st July and 9th September, two ♀♀ each held three eggs measuring 8 × 4 mm. Five of the Kilwa series taken between 15th and 27th October are young ones of from 18 to 26 mm. in length. Many termites were present in the two stomachs examined. Five Wahlberg's Snake-eyed Skinks were recovered from the stomachs of as many *Psammophis angolensis.*

Scelotes tetradactylus tetradactylus (PETERS)

1 (M.C.Z. 52480)	Kilwa.	26.x.50.
1 (M.C.Z. 52481)	Liwale.	ii.52.
1 (M.C.Z. 52482)	Songea.	14.i.50.

Midbody scale-rows 22-24; supraciliaries 4; fingers 4; toes 5; lamellae beneath fourth toe 3. Length of largest, a ♂ (M.C.Z. 52482), 128 (83 + 45) mm.

Riopa sundevallii (A. SMITH)

2 (M.C.Z. 52468-9)	Kilwa.	19.vii & 31.x.50.
20 (M.C.Z. 52470-9)	Liwale.	21.ii-11.vii.50.
3 (M.C.Z. 52540-1)	Mbeya, Tukuyu.	x.52.

Midbody scale-rows 25-29, average 27.1; lamellae beneath fourth toe 10-13, average 11.3. Largest perfect ♂ (M.C.Z. 52476), 223 (115 + 108) mm., surpassed in head and body length by a ♀ of 130 mm., whose tail, as is usual in this species, is regenerated. The smallest, taken on 9th July, measures 68 (39 + 29) mm., the tail being intact. One was recovered from the stomach of a *Lycophidion c. acutirostre.* Sundevall's Skink is known as *kijengamahuta* in Ngindo according to Ionides.

Melanoseps ater rondoensis LOVERIDGE

15 (M.C.Z. 52487-95)	Liwale.	7.xi.51.
1 (M.C.Z. 52484)	Songea.	ii.52.
4 (M.C.Z. 52485-6)	Tunduru.	14.i.50-4.ii.52.

The Songea skink clearly conforms to the race from Rondo Plateau and not to the larger *M. a. matengoensis* from the Matengo Highlands to the south of Songea.

Midbody scale-rows 18-20 (20 only on I. 2194, ex. Liwale); original tails (only 10 are perfect) included in length from snout to anus 3 to 3.3 times. Largest ♂ (M.C.Z. 52492), 131 (101 + 30) mm., though exceeded in length from snout to anus by another 10 mm. longer; largest ♀ (M.C.Z. 52487), 166 (125 + 41) mm. Consequently both considerably surpass any in the type series of 24 which I obtained on Rondo Plateau near Lindi. On 10th April one ♀ (M.C.Z. 52489) held small, but developing, ova, while M.C.Z. 52487 (exact date unknown) holds six roundish eggs with a diameter of about 4 mm.

Scolecoseps ? acontias (WERNER)

juv. (M.C.Z. 52483) Kilwa. 26.x.50.

Midbody scale-rows 18; supraoculars 2; supraciliaries 2; nuchals 2 only. Length 52 (40 + 12) mm. Werner's brief description contains no mention of supraoculars, supraciliaries, or nuchals. Nevertheless I tentatively refer this limbless two-inch skink to the species of which the only known example was collected by Eichelbaum at Dar es Salaam in 1903, and described by Werner in 1913 (1912). I have spent more fruitless hours searching for this elusive sand-burrower at Dar es Salaam than I care to contemplate. Mr. Ionides is greatly to be congratulated on the capture of this choice rarity. It is quite definitely not *S. boulengeri* Loveridge of Mozambique, a species which lacks supraciliaries and differs in many other ways.

GERRHOSAURIDAE

Unless otherwise stated it may be assumed that the undermentioned representatives of this family conform to the keys furnished in the revision (Loveridge, 1942d, pp. 483-543).

Gerrhosaurus major grandis Boulenger

♀	(M.C.Z. 52496)	Kilwa.	18.viii.50.
♂ ♀	(M.C.Z. 52497-8)	Liwale.	14.ix.50.

Ventrals from collar-row to anus 33-34; femoral pores 14-17, average for six counts 15.3. Length of ♂ (M.C.Z. 52497), 505 (205 + 300) mm., a record for this race. It remains to be seen whether *grandis* of Zululand can really be maintained as distinct from typical *major* of Zanzibar; it appears increasingly dubious. One would at least expect the plated-lizard from Kilwa, a coastal locality, to be referable to *major*, but it is not. Only by extensive collecting in the areas of intergradation will we be able to decide on the limits of the ranges.

Unfortunately these robust spiny-tailed lizards, almost two feet in length, are not easy to preserve on account of their subdermal bony plates being impervious to alcohol; the tails especially are apt to decompose and drop off after a week or two. This can be prevented only by inserting the point of a very sharp knife between the median rows of scales on the underside of the tail about three inches from the anus. Then cut *towards* the anus; should one attempt to do so in the opposite direction the readily discardable tail will simply fragment. A knife or scissors may be used to make an incision along the entire length of the lateral groove where it will be concealed. Through the opening thus made the viscera, with the exception of testes or ova, which should be left, can be removed. Failure to do this almost invariably results in decomposition setting in though often not apparent for a week or two. Under any circumstances, with so large a reptile it is advisable to decant the weakened alcohol after three or four days and replace it with fresh.

Ionides remarks that the Kilwa plated-lizard was basking on the side of a termite hill and retired into one of the openings. The reptile was strong enough to resist all efforts to pull it out by the tail; it was eventually withdrawn by tying a string around the groin in front of the hind limbs. On 30.vi.52 Ionides saw one of these lizards in the stomach of a cobra (*Naja n. nigricollis*). *Libulanjenje* is the name by which this lizard is known to the Ngindo.

Gerrhosaurus nigrolineatus nigrolineatus Hallowell

juv. (M.C.Z. 52499) Liwale. 19.vii.50.

Known as *mkwangula* to the Ngindo (*fide* Ionides), this quite typical Black-lined Plated-Lizard's stomach held, in addition to beetles and millipedes, a 68 mm. centipede, though the lizard itself measured only 353 (98 + 255) mm. Ionides recovered one from the stomach of an unusually large *Psammophylax t. tritaeniatus*.

Tetradactylus fitzsimonsi simplex Laurent

Tedradactylus (sic) *fitzsimonsi simplex* Laurent, 1950b, Revue Zool. Bot. Afr., 43, p. 350: Kundelungu, 1750 metres, Belgian Congo.

♂	(M.C.Z. 52500)	Luhila, Songea District	x.50.
♀	(M.C.Z. 52501)	Mchangoni, ,,	x.50.
♀	(M.C.Z. 52502)	Songea, ,,	ii.52.

No member of this serpentiform genus has been taken in Tanganyika Territory previously, and Mr. Ionides' captures provide fresh evidence of the herpetofaunal affinities with the southeast Belgian Congo. This recently described race differs from other forms of *fitzsimonsi* in having the nostril pierced in an entire nasal, bordered by the first labial; and the absence of a claw on the vestigial hind limb.

The Museum of Comparative Zoology has other examples of *simplex*, viz.

♂ ♀ & juv. (M.C.Z. 47410-2) Mambwe Mission, N.R. ix.44

and though none of the six differ appreciably from Laurent's two types, data derived from them does extend the known range of variation.

Supraoculars 2-4; supraciliaries 2-4; dorsal scale-rows transversely 12 + 2 reduced, longitudinally 61-66; ventrals transversely 6, longitudinally 60-66. Length of head included in the length from snout to anus 5.1 to 7.3 times; into that of tail 3 to 3.6 times (that it was only twice in Laurent's paratype suggests a regenerating tail). Larger ♂ (M.C.Z. 52500), 170 + (60 + 110 +) mm., as tail regenerated, for the other ♂ (M.C.Z. 47140) measures 259 (56 + 203) mm., largest ♀ (M.C.Z. 52501), 306 (68 + 238) mm.

In February one ♀ held two eggs measuring about 10.5 × 5.5 mm.; in the October ♀ the eggs were respectively 11.5 × 7 mm. and 13 × 5.5 mm.

CORDYLIDAE

Cordylus cordylus tropidosternum COPE

♂, 4 ♀♀	(M.C.Z. 52503-7)	Kilwa.	12.x-6.xi.50.
6 ♂♂, 7 ♀♀	(M.C.Z. 52508-14)	Liwale.	10.vi.48-30.x.50.

Though eight different counts were made on each individual in this fine series of Eastern Girdletails, the only extensions to the ranges given in the revision (Loveridge, 1944p, p. 15) are : Lower labials 4-6; transverse rows of dorsals 24-28; transverse rows of ventrals 26-30. Also the previous maximum length for a ♀ is exceeded by M.C.Z. 52511 measuring 186 (103 + 83) mm.

Eight ♀♀ held from 2-4 embryos, those at Liwale on 30th September being very small and still in the eggs which measured about 20 × 10 mm. Embryos at Kilwa on 12th October measured 21 + 15 mm. and an embryo ♂ of 26 + 22 mm., ranging to those of 6th November measuring 32 + 23 mm. The stomach of one lizard held an unusually large cricket, that looked like a *Brachytrypetes*, together with a long-limbed *Palystes-like* spider. Parasitic nematodes were also preserved.

Likorembako is the Ngindo name for *tropidosternum* according to Ionides.

LACERTIDAE

Nucras boulengeri boulengeri O. NEUMANN

juv.	(M.C.Z. 52524)	Kilwa.	27.vii.50.
♀	(M.C.Z. 52525)	Liwale.	17.vii.50.
juv.	(M.C.Z. 53107)	Miguruwe.	8.vii.53.
♂	(M.C.Z. 53108)	Mtepera.	7.vii.53.
♂	(M.C.Z. 52526)	Songea.	22.i.53.

Dorsals definitely smooth, at midbody in from 44-50 transverse scale-rows + 2 + 6 ventrals; femoral pores 12-14. Though the younger specimens exhibit a light vertebral line, surprisingly enough all agree with the typical race from Lake Victoria, and not with *N. b. kilosae* which is distinguished by keeled scales and colour. One ♂ had managed to overcome and swallow a relatively enormous black cricket.

Latastia johnstoni BOULENGER

♀	(M.C.Z. 52527)	Liwale	15.vii.50.
3 ♂♂	(M.C.Z. 53109)	Miguruwe.	7.vii.53.
♀	(I. 4141)	Mtepera.	8.vii.53.
2 ♂♂, 1 ♀	(M.C.Z. 53110-1)	Ngahama.	9.vii.53.

Dorsals keeled; midbody scale-rows 50-54, of which 6 are ventrals; femoral pores 14-17 a side. The largest, a Miguruwe ♂, measured 203 (55 + 148) mm. On 15th July one ♀ held three eggs measuring about 12 × 7 mm. The remains of a lizard, apparently referable to this species, were in the stomach of a Liwale Burrowing-Adder (*Atractaspis b. rostrata*).

Ichnotropis squamulosa Peters

juv. (M.C.Z. 52528) Kilwa. 27.x.50.
juv. (M.C.Z. 52529) Liwale. 1.x.50.

Midbody scale-rows about 49-53, of which 10 are ventrals; dorsals keeled; femoral pores 12-14.

Holaspis guentheri laevis Werner

1 (M.C.Z. 52515) Kilwa. 29.x.50.
10 (M.C.Z. 52516-23) Liwale. 24.vii-29.ix.50.
2 (I. 2187-8) Tunduru. 11.viii.48.

Midbody scale-rows 72-96, of which 6 are ventrals. Largest, a ♂ (M.C.Z. 52520), 107 (47 + 60) mm. All agree in having, in addition to the black vertebral and dorsolateral lines, a single black lateral line, which recently (1953e, p. 233) led me to revive Werner's name for East African examples of this arboreal lizard.

Mr. Ionides remarks (20.xi.51) that owing to the adroitness with which these lizards hide, their presence in a district is often unknown to the natives. He also points out that in springing from one tree to another a *Holaspis* will cover quite a long distance laterally.

AMPHISBAENIDAE

Ancylocranium ionidesi sp. nov.

Type. Museum of Comparative Zoology 52530, an adult ♂ from Kilwa, Southern Province, Tanganyika Territory. Collected by Mr. C. J. P. Ionides, 21st August, 1950.

Paratype. M.C.Z. 52531, a juvenile with same data as the type but taken on 18th October, 1950. Also two adult ♀♀ (M.C.Z. 53112; and I. 4109, now in British Museum) from Kilongo, Kilwa. Collected by Mr. C. J. P. Ionides, 4th and 5th July, 1953.

Diagnosis. Differs from *somalicum* (Scortecci, 1930), and agrees with *barkeri* Loveridge (1946e, p. 74, fig.) in having only a single pair of shields (parietals) immediately behind the rostral on the vertebral line. Differs from *barkeri* as follows :—

31 (20 + 11) segments in a midbody annulus; median ventrals in a single transversely dilated series; 222 annuli on body, 5 on tail (but this is almost certainly regenerated as its posterior half lacks annuli); only the type ♂ from Mbemkuru River, Lindi, Tanganyika Territory, known . . . *barkeri.*

34 (18 + 16) segments in a midbody annulus; median ventrals scarcely broader than their fellows; 302-327 annuli on body, 19-23 on tail; only the type ♂, two adult ♀♀ and a juvenile paratype from Kilwa District, on east coast north of Lindi, T.T., known . . . *ionidesi.*

Description. Rostral enormous, compressed, arched, with sharp cutting edge; nostril pierced in the rostral (left side) or in a nasal that anteriorly appears fused with the rostral (right side and in paratype); nasal sutures indicated on three sides; no prefrontals; no frontal; no postfrontals; a single pair of very small, widely separated shields on either side of rostral correspond to the parietals of *barkeri*, each being immediately above a narrow, vertically elongate ocular which is bordered anteriorly by the rostral, posteriorly by the first annulus; eye hidden; no temporals; upper labials two (the third labial of *barkeri* being reduced to a small scale at the commissure of the mouth), second larger and immediately below the ocular, whose anterior corner rests on the first labial; lower labials three, the first minute, the third enormous; mental tremendously elongate, ribbon-like (owing to fusion with both the anterior and posterior sublinguals of *barkeri*) bounded posteriorly by a row of four elongate gulars, which again are followed by a row of six similarly elongate scales flanked on either side by a relatively small shield.

Body annuli 327 (I got the same number on the paratype at one counting, but owing to it being somewhat macerated at one point neither my colleague Benjamin Shreve nor I could get the same count twice; we feel that 327 + or − is the more accurate way in which to state the paratype's annuli) between the rostral and the row corresponding to the posterior edge of anal opening; 34 (18 + 16) segments in a midbody annulus, the median ventral series not, or but scarcely, broader than their fellows; six anals (clearly so in paratype, obscured by extruded hemipenes in holotype); no preanal pores.

Color. In alcohol. White, uniform (? flesh-pink in life).

Size. Total length of holotype ♂, 215 (196 + 19) mm.; of larger paratype ♀, 217 (200 + 17) mm.; of juvenile paratype, 107 (97 + 10) mm.

Collector's original numbers, 2551, 2719, 4109 and 4117 respectively.

Amphisbaena ionidesii BATTERSBY

60	(I. 1996 ... 3475)	Liwale.	16.ii.50-20.vi.52.
♂ ♀	(M.C.Z. 52532-3)	Liwale.	30.iii.50 & 16.xi.51.
♀	(M.C.Z. 52542)	Liwale.	21.x.52.
♂ ♀	(M.C.Z. 52534-5)	Songea.	16.vii.51.
40	(I. 1728 ... 3622)	Tunduru.	11.i.50-19.iii.52.

In view of the previously published (Loveridge, 1951a, p. 184, Fig. 1) data derived from an even larger Liwale and Tunduru series of this interesting worm-lizard, it scarcely seemed worth while to devote the time necessary to a detailed study of this fresh material. However, one new fact of outstanding interest is that on 16th July a Songea ♀ (M.C.Z. 52535), with a snout to anal length of 130 mm., held two embryos, unpigmented except for their black eyes, measuring 42 and 45 mm. over all. Also on 21st October a Liwale ♀ (M.C.Z. 52542), measuring 202 (180 + 22) mm., held two embryos, unpigmented except for their eyes, measuring 76 and 77 mm. over all. Previous maximum measurements are surpassed by a ♂ (M.C.Z. 52532) of 210 (185 + 25) mm., and ♀ (M.C.Z. 52533) of 212.5 + (190 + 22.5 +) mm., the tail being regenerating. Nematodes (preserved) were present in the intestines of the last named specimen. Ionides Worm-Lizards were recovered from the stomachs of *Calamelaps u. unicolor*, *C. u. warreni*, *Amblyodipsas k. ionidesi Chilorhinophis c. liwaleensis*.

VARANIDAE

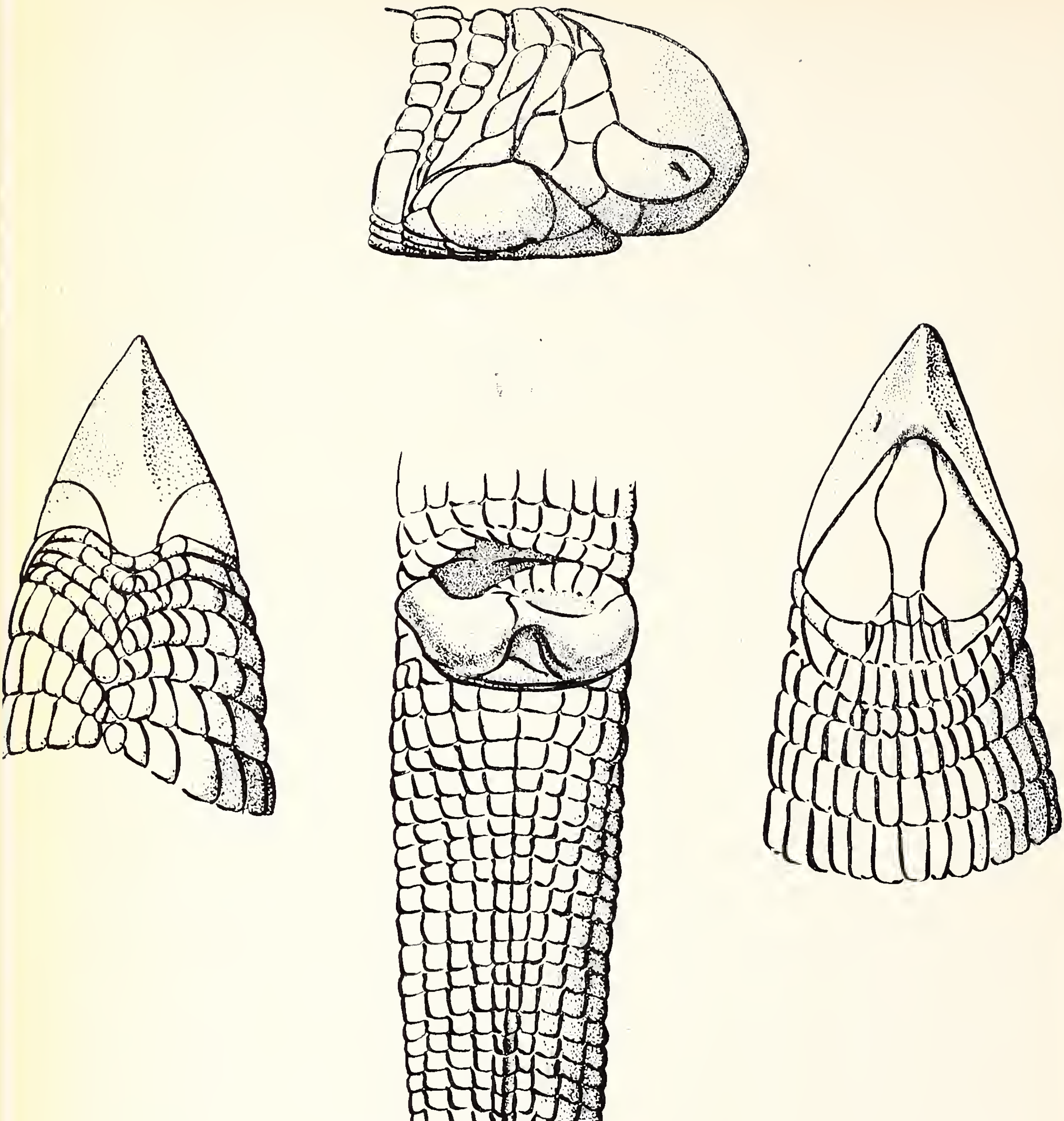
Varanus exanthematicus microstictus BOETTGER

5 (M.C.Z. 52536-9) Liwale. 12.xi.49-19.xi.51.

The following data, like that derived from a series of Savanna Monitors that I (Loveridge, 1942e, p. 330) obtained at Mikindani, extend the ranges given by Mertens (1942e, p. 351) who has shown that *ocellatus* Heyden is a synonym of typical *exanthematicus* (Bosc) of Senegal and the Sudan, and should not be applied to the dry country monitors of Kenya and Tanganyika.

Nape scales (without surrounding disc) distinctly larger than those on occiput and centre of back; midbody scale-rows 137-143; ventrals from collar fold to level of insertion of hind limbs 86-100.

The coloring in alcohol of the nine-inch juvenile is light grey, handsomely variegated with black and white. Most conspicuous is the black line from eye to shoulder, two slightly narrower ones from the occiput converge on nape only to diverge again till they terminate by merging with the black lines encircling the first pair of white ocelli between the forelimbs; in all there are five rows of these black-edged ocelli (2 to 5 in a row) between fore and hind limbs, followed by a sixth on base of tail that is more or less fused and bar-like, forming the first of a dozen light annuli that alternate with grey or black interspaces on the black-tipped tail; the fore limbs are grey variegated with jet black and pure white, the latter forming crossbars on the toes. Below, creamy white, a large blackish patch on the base of the throat; breast, belly, and tail crossed by numerous narrow wavy dark lines arranged in pairs.



♂ Holotype of *Ancylocranium ionidesi* (M.C.Z. 52530). 8 x nat. size.

The ocelli have disappeared entirely from one of the third-grown specimens (M.C.Z. 52538), whose coloring is striking as a result of the black markings showing a tendency to coalesce and form crossbars. The coloring of the massive-headed old ♂ is a nondescript dirty brown or black, relieved by a certain amount of yellow variegations.

This magnificent ♂ (M.C.Z. 52539) has been skinned out and the body removed, but owing to the toughness of the hide its present measurement of 1430 (660 + 770) mm. should be substantially correct. The juvenile (M.C.Z. 52536) described above is only 230 (110 + 120) mm., the smallest I have ever seen.

Mr. Ionides remarks that they had quite a tussle to secure the nearly five-foot male but that it quickly succumbed when given a drop of nicotine. At my request he is endeavouring to ascertain where these dry-country monitors lay their eggs. He wrote (20.xi.51) me that outside a hole at Lihuni, in the northern part of Liwale District and miles from water, he found some undoubted *Varanus* eggs, broken and with indications that they had been swept by a grass fire. As this was in mid-October it appeared certain that the eggs had been lying exposed since the previous rainy season.

The old ♂ harboured many ticks which have been identified as *Aponomma exornatum* Koch by my colleague Dr. J. C. Bequaert.

TYPHLOPIDAE

Typhlops schlegelii mucruso (Peters)

2	(M.C.Z. 52543-4)	Kilwa.	30.x & 3.xi.50.
153	(M.C.Z. 52545-600)	Liwale.	18.i.50-iv.52.
2	(M.C.Z. 52601-2)	Nachingwea.	4.xi.51.
4	(M.C.Z. 52603-5)	Ruponda.	26.xii.51-7.iv.52.
6	(M.C.Z. 52606-9)	Songea.	16.v.50-ii.52.
26	(M.C.Z. 52610-22)	Tunduru.	26.xii.49-29.ii.52.

I am confident that never before has so fine a series of the Eastern Schlegel's Blind-Snake been brought together. In part this was due to an intensive search for the rare *T. t. tettensis*, only three of which were turned up during the period covered by this report. It would be interesting to know why two species, so similar in appearance, should exist in a ratio of three to 193! *T. t. tettensis* can most readily be distinguished from the lineolate form of *mucruso* by the number of midbody scale-rows, consequently I counted every individual in the above series with the following results.

Midbody scale-rows 30-36, viz. 30 (27 ex.), 31 (3), 32 (99), 33 (13), 34 (42), 35 (1), 36 (8), average for 193 snakes 32.3; midbody diameter included 25 (M.C.Z. 52552) to 46 (M.C.Z. 52596) times in total length, however, only 7 are 40 times or over, and only 10 are under 27 times. Total lengths range from 125 (123 + 2) mm. (I. 3127) to an adult ♀ (M.C.Z. 52581) of 580 (574 + 6) mm., while the largest verified ♂ (M.C.Z. 52596) is 460 (455 + 5) mm. Such large examples are quite exceptional, however; indeed only 15 of the 193 snakes are over 400 mm., while 65 measure less than 200 mm., the average for the entire series being 246 mm.

It is interesting to note that the smallest of all, measuring 125 mm., was taken on 6th December, the next smallest (128 mm.) on 13th November, and that each month thereafter there is a steady increase in average size until April. The average size and monthly incidence of *mucruso* under 200 mm. is: November, 127 mm. (3), December 156 mm. (28), January, 174 mm. (17), February, 178 mm. (3), March, 178 mm. (7), April, 191 mm. (5), May, 150 mm. (2), June, 145 mm. (1), July, 145 mm. (1). From which it seems fair to assume that the usual time for the young to appear, if not hach, is about the beginning of the rains—mid-November to mid-December.

The coloration is highly variable, but if the material be sorted into the three main types (corresponding to similar color variations in *T. p. punctatus*), the number assigned to each is as follows: blotched (100), checkered (12), lineolate (81).

One North Zambezi Blind-Snake was recovered from the stomach of a *Calamelaps u. unicolor*.

Typhlops tettensis tettensis (Peters)

7 (British Museum) Liwale. 27.iii.48-6.iii.49
2 ♂♂, 1 ♀ (M.C.Z. 52523-5) Liwale. 17.ii.51-i.52.

Midbody scale-rows 22; midbody diameter included 32.3 to 46.6 times in total lengths of from 210 (206.5 + 3.5) mm. to 420 (415 + 5) mm.

The single snake (M.C.Z. 50066) that I referred to as "*tettensis? obtusus* Peters" in my report (1951a, p. 186) on the first Ionides collection, is, of course, the typical subspecies. Last year I was able to study the seven specimens presented by Mr. Ionides to the British Museum, also the type of *obtusus*, besides a series of the latter I collected in Nyasaland. In ten of the eleven examples of *t. tettensis* that I examined the preocular is in contact with 2nd and 3rd upper labials, in only one snake (R. 1819 in the B.M.) it is in contact with the 2nd only. In this it agrees with Peters' Fig. 1c (of Pl. xv.), while Fig. 1a corresponds to the majority.

As a similar variability occurs in both the other forms it is necessary to abandon this as a key character and present an entirely revised key to this little group. Though there are 22 midbody scales in all 12 *t. tettensis* known, and 24 in all five *rondoensis*, they range from 22 to 24 in the 12 known *obtusus*. The colouring and slender habitus of *obtusus* is such that I now doubt whether its relationship to the other two is really subspecific, but in view of the difficulty in distinguishing them it might be as well to treat them as such until more data has accumulated regarding their variation and distribution.

Typhlops braminus (Daudin)

1 (M.C.Z. 52626) Liwale. 11.x.50.

Midbody scale-rows 20; diameter of 3 mm. included 50 times in total length of 150.5 (147 + 3.5) mm. Every additional record of the inland migration of this Indian Worm-Snake—long established on the East African littoral—is of interest.

LEPTOTYPHLOPIDAE

Leptotyphlops conjuncta conjuncta (Jan)

1 (M.C.Z. 52627) Kilwa. 17.x.50.
11 (M.C.Z. 52628-33) Liwale. 17.ii.50-13.iv.52.
1 (M.C.Z. 52634) Manyoni. 24.viii.51.

Midbody scale-rows 14 (but only a few counted); midbody diameters included 48.5 to 80 (M.C.Z. 52634) times in total lengths of from 92 (85 + 7) mm. to 220 (205 + 15) mm. (M.C.Z. 52633). It is the 200 mm. Manyoni snake that extends the previous diameter/length range of from 32 to 72 and which differs from all the rest in being brown above and below with the head somewhat darker and the end of the tail jet black. Otherwise in coloration the series is glossy black, uniform, or below brown; in one almost white along median line of belly.

BOIDAE

Python sebae (Gmelin)

Known as *chatu* in Ngindo according to Ionides, who writes (30.iv.50) that on four separate occasions he has known young pythons to be caught in fish traps; which suggests that they may be partly piscivorous when young.

Twice (8.v.50) he has found them eating birds, viz. "a red-eyed dove" and a "fork-tailed drongo".

On the morning of 19.x.52 Ionides observed a python, slightly over four feet in length, lying along a branch with its head concealed in a long, though narrow, fissure in the trunk. After capturing the python Ionides examined the crevice in which was tightly wedged the body of an adult male ground-squirrel (*Xerus* sp.). Finding no marks on the body, Ionides concluded that the squirrel had died as a result of being seized by the head. Presumably the python had entered the hollow

tree through a second hole, above, and seized the squirrel in its nest which was in the cavity. Then, either unable or unwilling to swallow the body in so confined a space, the python had been endeavouring to drag it through the fissure when disturbed. Whether it would have succeeded is questionable, to judge by the difficulty Ionides experienced when he attempted to extract the corpse with a pair of tongs.

COLUBRIDAE

Natriciteres olivacea uluguruensis (Loveridge)

3 ♀♀ (I. 2344, etc.)	Liwale.	v.50-i.52.
♀ (M.C.Z. 52635)	Mbeya.	x.52.
♀ (M.C.Z. 52636)	Songea.	17.v.50.

Midbody scale-rows 17; ventrals 130-139; subcaudals 70-77, but tails of two others truncated. Smallest, taken early in January, measures only 155 (110 + 45) mm. Mr. Ionides informs me that the snake labelled Songea was actually taken on the Rovuma River a dozen miles from Songea Boma.

The data derived from a much longer series (of which half were sent to the British Museum) contributed by Ionides in 1950 were utilised in a revision of the genus of which a key and synopsis has been published (Loveridge, 1953e, pp. 248-252). These snakes belong to a group that has erroneously been referred to eight different genera, including *Natrix* and *Neusterophis*.

Lycodonomorphus rufulus whytii (Boulenger)

♀ (M.C.Z. 52637) Songea Boma. 12.v.50.

Midbody scale-rows 19; ventrals 159; subcaudals 47. Total length 709 (590 + 119) mm.

This water-snake agrees with the Nyasaland type in sex, midbody scale-rows and subcaudals, but in length surpasses all previously known examples of this race. My reasons for transferring "*Glypholycus whytii* Boulenger" to *Lycodonomorphus* were recently stated (1953e, p. 252, 255). Mr. Ionides is to be congratulated in securing the second known specimen of this race from Tanganyika Territory.

Its stomach contained the hind legs of a frog (*Rana fuscigula*) and the entire digestive tract was riddled with worms. These have been identified by Mr. J. T. Lucker as a ♀ Oxyuroidea besides both sexes of a *Kalicephalus*, probably *K. micrurus*. In the mesentery were two ♂ *Dracunculus* sp. and numerous encapsuled larvae of one of the Physalopteridae.

Boaedon lineatus lineatus (Dumeril & Bibron)

juv. ♀ (M.C.Z. 52638) Liwale. 20.iv.50.

Midbody scale-rows 29; ventrals 213; subcaudals 50; preocular 1 (R) or 2 (L); temporals 1 + 1 (R) or 1 + 2 (L). Beneath the ventral scutes of the preanal region are many mites.

Lycophidion capense capense (A. Smith)

♂ ♀ (M.C.Z. 52639)	Liwale.	29.iv.50.
♀ (M.C.Z. 52640)	Ruponda.	26.xii.51.

Midbody scale-rows 17; ventrals 180-193; subcaudals 33-43. Chin and throat mostly white.

Lycophidion capense >< *acutirostre* Gunther

♀ (M.C.Z. 52641)	Liwale.	7.xii.50.
♀ (M.C.Z. 52642)	Tunduru.	31.xii.51.

Midbody scale-rows 17; ventrals 162-165; subcaudals 22-28. Chin and throat black like the rest of the underside. In both colour and subcaudal counts these snakes agree with *acutirostre*, but because of their intermediate ventral count I continue to treat these eastern snakes as intermediates, besides which it will be noted that quite typical *capense* also occurs at Liwale.

The stomach of the Tunduru snake held the remains of a skink (*Riopa sundevallii*).

Mehelya nyassae (GUNTHER)

juv. ♂	(M.C.Z. 52643)	Liwale.	21.iv.52.
♀	(M.C.Z. 52644)	Tunduru.	3.ii.52.

Midbody scale-rows 15; ventrals 168-176; subcaudals 64-66. For some reason young Nyasa File-Snakes are extremely scarce and the ♂ measures only 233 (190 + 43) mm. I have taken this reptile in Nyasaland and Kenya, but never in Tanganyika though there is a single record from the Usambara Mountains.

Philothamnus hoplogaster (GUNTHER)

♂	(M.C.Z. 52645)	Kilwa.	22.viii.50.
7 ♂♂, 20 ♀♀	(M.C.Z. 52646-59)	Liwale.	13.iii.50-14.iii.52.
2 ♂♂, 1 ♀	(M.C.Z. 52660-1)	Ruponda.	25-28.xii.51.
3 ♀♀	(M.C.Z. 52662-3)	Tunduru.	29.xii.51-4.ii.52.

Midbody scale-rows 15, except in three ♀♀ (M.C.Z. 52651-3) which, though possessing 15 anteriorly, at actual midbody have only 13, 12, and 11 respectively; in this character, therefore, they agree with *macrops* though outside the range of that species in the number of their ventrals and subcaudals. Ventrals of ♂♂, 144-154; of ♀♀, 148-164; subcaudals of ♂♂ 87-101, of ♀♀ 73-89, thus achieving a slight extension in the ranges stated in my revisionary key (1951c, p. 4). One ♂ (M.C.Z. 52661) has 81 subcaudals, but a close examination of its tail convinces me that the point has been regenerated.

In life the napes of several Liwale snakes evidently displayed handsome black crossbarring or paired spots. Largest ♂ (M.C.Z. 52647), 645 (445 + 200) mm.; largest ♀ (M.C.Z. 52651), 720 (530 + 190) mm., both below the verified records. 15 ♀♀, taken in November (3), December (7), and January (5), are distended with large ova. The stomach of one ♂ (M.C.Z. 52650) contains many eggs that appear to me to be those of the burrow-laying frog (*Arthroleptis s. stenodactylus*). On the throat of another snake is a tick.

Philothamnus semivariegatus semivariegatus (A. SMITH)

5 ♂♂, 2 ♀♀	(M.C.Z. 51383-5, 52664)	Kilwa.	13.viii.50-6.ix.51.
4 ♂♂, 4 ♀♀	(M.C.Z. 51379-82)	Liwale	4.v.49-5.iv.50.
2 ♂♂, 4 ♀♀	(M.C.Z. 55665-7)	Tunduru.	26.viii.48-26.ii.52.

Midbody scale-rows 15; ventrals 174-194; subcaudals 136-159. The Tunduru series are all heavily spotted. Other data obtained from this series has been used for a generic revision now in manuscript. To the Ngindo this bush-snake, like the last, is known as *njoka mahamba* (green snake), or simply *namahamba* (the green one), a name that cannot be considered specific.

Meizodon semiornata (PETERS)

♂ ♀	(M.C.Z. 52668-9)	Kilwa.	25.ix. & 7.xi.50.
22 ♂♂, 22 ♀♀	(M.C.Z. 52670-98)	Liwale.	8.xi.50-25.iii.53.
3 ♂♂, 3 ♀♀	(M.C.Z. 52699-702)	Tunduru.	31.xii.51-23.ii.52.

Midbody scale-rows 21; ventrals 159-198 (♂♂ 159-182; ♀♀ 182-198); subcaudals 76-88 (♂♂ 76-85; ♀♀ 76-88); lower labials 9-10, the first 4 or 5 in contact with the anterior sublinguals; preocular 1 (95 sides) or 2 (9); postoculars 2 (103) or 3 (1); temporals 2 + 1 (1), 2 + 2 (81) or 2 + 3 (22). Largest ♂ (M.C.Z. 52668), 590 (455 + 135) mm.; ♀ (M.C.Z. 52685), 767 + (600 + 167 +) mm. The majority are of small size, however, the youngest ♂ being 209 (160 + 49) mm. and ♀ only 218 (165 + 53) mm. with unhealed umbilical scutes.

With a single exception (March), the ten youngest snakes were taken in November or December. Seasonal incidence of capture for the entire series was Sept. (1); Nov. (4); Dec. (15); Jan. (1); Feb. (5); March (13); April (5); unspecified (6). Unquestionably these 50 snakes constitute the finest series of Semiornate Smooth-Snakes ever assembled. I have always regarded the species as scarce, having taken only ten examples in as many years collecting. However, it is a savanna species and my investigations were chiefly in montane-forest country.

Ionides remarks that a ♂ (M.C.Z. 52674) had a newborn rat in its stomach.

Prosymna pitmani Battersby

2 ♂♂, 2 ♀♀ (M.C.Z. 52703-5) Liwale. 25.xii.51-v.53.

Midbody scale-rows 19; ventrals 141-157; subcaudals 17-27; preocular 1, rarely 2 (on right side of M.C.Z. 52704 only). Length of larger ♂, 255 (225 + 30) mm., of larger ♀, 308 (285 + 23) mm.

As this recent discovery of Mr. Ionides was based on two ♂♂ from Kilwa, the above series naturally provide some extension of its known variation as well as of its range. Judging by a revisionary study of the genus which I hope to publish in due course, *pitmani*—the only member of the genus with 19 scale-rows—is probably ancestral to *a. stuhlmanni.*

Ionides suggests (5.i.53) that as all three Kilwa specimens were taken within a somewhat restricted area, their distribution may be localised.

Prosymna ambigua stuhlmanni (Pfeffer)

3 ♂♂, 3 ♀♀	(M.C.Z. 51399-400, 52706-7)	Kilwa.	2.iii.50-9.xii.51.
23 ♂♂, 26 ♀♀	(M.C.Z. 51388-97)	Liwale.	17.i.50-27.iv.50.
3 ♂♂, 1 ♀	(M.C.Z. 51398, 52708-10)	Tunduru.	11.i.50-31.xii.51.

Midbody scale-rows 15; ventrals 130-155 (♂♂ 130-142; ♀♀ 145-155); subcaudals 20-33 (♂♂ 30-34; ♀♀ 19-28); postoculars 2 (108 sides), rarely 1 (9), or absent (1); temporals 1 + 1 (1), 1 + 2 (110), 1 + 3 (6) or 2 + 2 (1). Largest ♂ (M.C.Z. 52709), 232 (193 + 39) mm.; ♀ (I. 3536), 274 (250 + 24) mm. On 5th January and 23rd February ♀♀ were gravid with large eggs.

Dasypeltis scaber scaber (Linne)

4 ♂♂, 2 ♀♀	(Brit. Mus.)	Liwale.	V.D. (Ionides coll.)
1 ♂, 4 ♀♀	(M.C.Z. 52722-4)	Liwale.	13.xi.-15.xii.51.
♀	(M.C.Z. 52725)	Nachingwea	4.xi.51.
♀	(M.C.Z. 52726)	Kilwa.	29.x.50.

Midbody scale-rows 23-27; ventrals 197-243; subcaudals 54-68. Other data derived from this series of egg-eaters will be utilized in a revisionary study of the genus by Gans. On 26th April, 1952, when about to pack a pair of these snakes for dispatch, Mr. Ionides found them in coitu.

Dasypeltis scaber medici (Bianconi)

♀ (M.C.Z. 52721) Liwale. 28.viii.50.

Midbody scale-rows 25; ventrals 247; subcaudals 72. The repeated recurrence of this "race" in the same localities where typical *scaber* is found, will receive attention in the forthcoming paper to which reference is made above.

Telescopus semiannulatus semiannulatus (A. Smith)

2 ♀♀	(M.C.Z. 52727-8)	Kilwa.	27.viii-29.x.50.
7 ♂♂, 7 ♀♀	(M.C.Z. 52730-9)	Liwale.	10.ii.50-15.iii.52.
♂	(M.C.Z. 52729)	Nachingwea.	4.xi.51.
♂ ♀	(M.C.Z. 52740-1)	Tunduru.	29.i.50-31.xii.51.

Midbody scale-rows 19; ventrals 202-232 (♂♂ 202-216; ♀♀ 216-232); subcaudals 58-75 (♂♂ 66-75; ♀♀ 58-71); temporals 2 + 2 (16 sides), 2 + 3 (20), or 3 + 3 (2). The number of dark, saddle-shaped blotches on body and tail are highly variable, ranging from 22-33 on the body, 6 to 15 on the tail. Largest ♂ (M.C.Z. 52735), 588 (480 + 108) mm.; largest ♀ (M.C.Z. 52741), 765 (650 + 115) mm. In the stomachs of each of the two smallest, both under a foot in length, was a gecko, viz. *Lygodactylus g. grotei* and *L. p. picturatus* respectively, while Ionides informs me (8.v.50) he recovered a ♀ *Agama m. mossambica* from one adult, a swallow-like bird from another.

Trinomials are used on account of *T. s. beetzi* (Barbour) of Southwest Africa, which is distinguished by having 21 midbody scale-rows and an entire anal. It appears to have more blotches (31-39 + 18), possibly fewer ventrals (♂ 202; ♀ 218), and fewer subcaudals (♂ 50; ♀ 46).

Crotaphopeltis hotamboeia hotamboeia (Laurenti)

♀ (M.C.Z. 52742) Liwale. 25.iv.50.

Midbody scale-rows 19; ventrals 147; subcaudals 38; preocular 1; postoculars 2. On 11th December, 1951, a ♀ laid an egg on Ionides' verandah.

Chamaetortus aulicus aulicus Gunther

♀ (M.C.Z. 52743) Liwale. 27.vii.50.
♀ (M.C.Z. 52744) Ruponda. 13.vii.50.

Midbody scale-rows 17; ventrals 190-196; subcaudals 95, the tail being truncate in the other specimen. The stomach of the Liwale snake held two juvenile *Hyperolius*, the Ruponda reptile the remains of an *Arthroleptis s. stenodactylus*.

Ionides informs me (14 & 28.vii.50) that the Ruponda snake was in a bamboo, the Liwale specimen among bamboos by the river, but that two others taken by him were in miwale palms at Liwale Boma. He suggests that secretive habits may be responsible for the scarcity of *aulicus* in collections.

Hemirhagerrhis nototaenia nototaenia (Gunther)

♀ (M.C.Z. 52745) Kilimarondo. 10.xii.51.
1 ♂, 7 ♀♀ (M.C.Z. 52746-50) Kilwa. 4.iii.48-2.xi.50.
9 ♂♂, 30 ♀♀ (M.C.Z. 52751-81) Liwale. 17.i.48-29.iv.53.

Midbody scale-rows 17; ventrals 156-170 (♂♂ 157-166; ♀♀ 156-170), average 159.3; subcaudals 69-80 (♂♂ 70-80; ♀♀ 69-80), average 73.6; upper labials 8; preocular 1; postoculars 2 rarely 1 (on right side of M.C.Z. 52751 only); temporals 1 + 2. Largest ♂ (M.C.Z. 52746), 330 (250 + 80) mm.; largest ♀ (M.C.Z. 52747), 359 (270 + 89) mm. On October 16 a ♀ held two elongate eggs measuring 15 × 3.5 and 20 × 3 mm. respectively; on 27th October another ♀ held two eggs measuring 18 × 4 mm. and 20 × 4 mm.; on 29th May a third snake held four eggs approximately 24 × 6 mm. Stomachs of two snakes examined held geckos, viz. *Hemidactylus mercatorius* and *Lygodactylus p. picturatus*.

It will be noted that there are no sexual differences reflected in the scale-counts. Counts were made on all but four of the entire series and the averages go far towards reducing the alleged disparity in ventral and subcaudal counts as between *nototaenia* and its western form *viperina*. I am inclined to question the old record of 98 subcaudals. However, so far as these 47 snakes are concerned, the difference in dorsal pattern (cf. Bogert, 1940, p. 76, fig. 12) still holds good.

Known to the Ngindo as *kitandamba*, i.e. one found among "ndamdamba" beans, but loosely applied to *Psammophis angolensis*, *Chilorhinophis* and *Aparallactus* sp.

Rhamphiophis oxyrhynchus rostratus (Peters)

Ionides kindly sent me the following note regarding breeding. Writing on 20.xi.49, he remarks that a scarcely halfgrown Eastern Beaked-Snake had just laid three large cylindrical eggs. On 27.x.50 he says that on the night of 16th October a ♀ laid four eggs, on the night of the 17th six more, on the night of the 18th two, at midday on the 20th two, at night on the 21st one, and appeared to be still carrying two eggs when he wrote. Known to the Ngindo as *njoka uhono*, i.e. sesame snake, from the resemblance of its scales to sesame.

Psammophylax tritaeniatus tritaeniatus GUNTHER

18	(M.C.Z. 52812-23)	Liwale.	26.iii.50-12.iii.52.
3	(M.C.Z. 52824-5)	Songea.	x.50-ii.52.
2	(M.C.Z. 52826-7)	Tunduru.	9.vi.50 & 3.iii.52.

Midbody scale-rows 17; ventrals 139-154; subcaudals 50-59; rostral as broad as (15 examples), or broader than (8) deep; upper labials 7 (right side only of M.C.Z. 52812) or 8, the fourth and fifth entering the orbit, or fifth only (right side only of M.C.Z. 52815); lower labials 9-11, the first 4 or 5 in contact with the anterior sublinguals; preocular 1, rarely 2 (on 5 sides only); postoculars 2; temporals 2 + 2 (2 sides), 2 + 3 (35), or 2 + 4 (9). Largest ♂ (M.C.Z. 52812), 574 (460 + 114) mm.; largest ♀ (M.C.Z. 52813), 629 (510 + 119) mm.

In December, 1948, Ionides collected three hatchlings, apparently just emerged, all together. On 13th, 15th and 17th December, 1951, he obtained three more in the same general locality. Two of these measured 140 + 33 mm. and 140 + 39 mm. respectively. Another juvenile, taken in February, 1952, is 170 + 41 mm. The largest ♀ (*vide supra*) had a Black-lined Plated-Lizard (*Gerrhosaurus n. nigrolineatus*) in her stomach.

In April and December, 1948, Mr. Ionides obtained half-a-dozen of these White-bellied Grass-Snakes at Mbwemkuru, in southern Liwale District, at altitudes under 2,000 feet. This discovery of which he wrote me (19.v.49), was largely instrumental in my realization that the dark-bellied montane form (*T. v. variabilis*) occurring above 5,000 feet in the mountains of southern Tanganyika was a recognizable race to which I had consistently misapplied the name *T. t. tritaeniatus*.

Psammophis angolensis BOCAGE

♀	(M.C.Z. 53114)	Gahama.	9.vi.53.
2 ♂♂, 1 ♀	(M.C.Z. 52782-4)	Kilwa.	12.x.50-21.viii.52.
1 ♂, 1 ♀	(M.C.Z. 52785-6)	Lipumba,	Songea. 30-31.v.50.
12 ♂♂, 14 ♀♀	(M.C.Z. 52787-806)	Liwale.	11.iv.50-27.iii.53.
1 ♀	(M.C.Z. 52807)	Msuega.	6.ix.52.
1 ♂, 1 ♀	(M.C.Z. 52808-9)	Ruponda.	26-28.xii.52.
2 ♀♀	(M.C.Z. 52810-1)	Tunduru.	5-8.i.52.

Midbody scale-rows 11; ventrals 135-153 (too many of the snakes in the Liwale series are immature to permit of sexing with confidence; *if* a sexual difference in ventrals does occur it is probably ♂♂? 135-141 and ♀♀? 141-153); subcaudals 56-68 (no sexual difference); upper labials 8, fourth and fifth entering the orbit, except on one side of 5 snakes where it is 7, with the third and fourth entering; lower labials 8, the first 4 in contact with the anterior sublinguals, or 9 (on 3 sides only) with 5 in contact; preocular 1, possibly 2 (in M.C.Z. 52784); postoculars 2; temporals 1 + 2, rarely 1 + 1 (on 6 sides only out of a total of 72). Largest ♂ (M.C.Z. 52809), 368 (277 + 91) mm.; largest ♀ (M.C.Z. 53114), 430 (315 + 115) mm., the smallest (M.C.Z. 52796), 133 (100 + 33) mm., taken in January as were four of the five measuring less than 200 mm. in length.

On 6th September, at Msuega, a ♀ held 4 elongate eggs ranging from 15-18 × 5 mm. Stomachs of 8 snakes held remains of skinks, in 5 instances identifiable as *Ablepharus wahlbergii*, and an egg of the latter. Possibly this dwarf form of *Psammophis* largely confines its diet to *wahlbergii*, as its gape would scarcely permit of its taking most adult skinks. A young *P. angolensis* was recovered by Ionides from the stomach of a Burrowing-Adder (*Atractaspis b. rostrata*).

Thelotornis kirtlandii capensis A. SMITH

Ionides states (13.x.50) that he placed an average-sized Cape Vine-Snake, about a yard long, in a box with a fair-sized *Chamaeleo d. dilepis*. Though the snake had been caught only a few hours before, it promptly seized the chameleon by the back and for several minutes held it, head downwards, clear of the ground. After the initial struggle which followed its seizure, the chameleon offered little resistance. Eventually the snake worked its jaws along to the head of the chameleon and then swallowed it. Immediately afterwards this same vine-snake struck at a House Gecko (*Hemidactylus mabouia*) but, missing, did not follow up the attack.

Ionides was intrigued by the fact that Boomslangs (*Dispholidus typus*), though habitually preying on chameleons, rarely manage to master so large an example at the first attempt. He had supposed that the potent venom of a boomslang was necessary to overcome the resistance offered by a large chameleon. Yet the vine-snake had managed to gain control very quickly, though apparently the venom of a vine-snake is less toxic. At least Ionides supposes so, for he has frequently been bitten by vine-snakes without noticing any after effects, even on occasions when he has allowed them to hang on and chew. One should not overlook the possibility that the rear, venom-conducting teeth may not have come into play if the gape of the particular snake did not permit it.

Dispholidus typus (A. SMITH)

♂ (M.C.Z. 52828) Songea. 22.xii.52.

Midbody scale-rows 19; ventrals 179; subcaudals 120. Total length 1115 (800 + 315) mm. Colour green, the usual livery for males in this general region. On 4th July, 1949, Ionides observed a pair of Boomslangs in a tree, intertwined and apparently mated; one was green, the other brown. Females are usually brown, but an examination of the *Dispholidus* material from all over Africa preserved in the Museum of Comparative Zoology, reveals that this is not a hard and fast rule. Ionides writes (20.ix.52) that black Boomslangs, apparently of both sexes, occur at Liwale in addition to the green and brown adults. Besides which there is the juvenile livery, somewhat similar to that of the Vine-Snake, of grey spotted with pale blue on the nape and back, especially anteriorly. Older juveniles lose the blue spots. One young male, reports Ionides, was just assuming the adult colouring, being green with black between the scales anteriorly, while posteriorly it was a lighter green.

In December, 1948, Ionides wrote that a captive Boomslang, gentle but rather nervous, refused to look at lizards though readily tackling fair-sized chameleons (*Chamaeleo d. dilepis*). On 20.i.50 he wrote of a nearly six-foot long, dark-olive snake that seized the largest chameleons unhesitatingly.

Occasionally disputes arose over the possession of a chameleon, resulting in the contestants embedding their poison fangs in each other and holding on, sometimes for considerable periods. In one instance a larger Boomslang engorged, together with a chameleon, the head and fully six inches of its adversary before the latter managed to extricate itself and withdraw. Apparently no ill-effects were suffered by the vanquished snake for Ionides continued to keep it in health for some time afterwards. Occasionally, following fights between Boomslangs, there is a certain amount of haemorrhage but Ionides concludes these snakes have developed some degree of immunity to the venom of their own species.

On 30.vii.52 he wrote that he understands one of the attendants at Durban Snake Park had succumbed to the bite of a Boomslang, though there was some possibility of hypersensitivity having developed after immunization by antivenene.

Calamelaps unicolor unicolor (REINHARDT)

3 ♂♂ (M.C.Z. 52835-6) Liwale. 19.ii-25.iv.52.

Midbody scale-rows 17; ventrals 159-167; subcaudals 25-26.

Ionides informs me that he sent a third snake with 17 and a fourth with 21 midbody scale-rows to C. R. S. Pitman, who carefully verified the counts. The four races of *unicolor* differ apparently only in the number of midbody rows, being 15, 17, 19 or 21 as one proceeds from Portuguese Guinea east to Tanganyika where three of the races are present. It seems absurd that three races should occur at Liwale, unless geographically it is their meeting place and an area of intermediates. Nevertheless, until more light can be shed on the ranges of the respective forms, it seems advisable to assign these three Purple-glossed Snakes to the typical race. In many colubrid snakes the number of midbody scale-rows varies in a species within restricted limits, in others —like *Chilorhinophis* and *Aparallactus* which are closely related to *Calamelaps*—it remains static for the entire genus.

The stomach of one snake held a worm-lizard (*Amphisbaena ionidesii*), another a young blind-snake (*Typhlops s. mucruso*).

Calamelaps unicolor warreni BOULENGER

3 ♂♂, 10 ♀♀	(M.C.Z. 52837-42)	Liwale.	26.ii.50-26.iv.53.
♂	(M.C.Z. 52843)	Ruponda.	28.xii.51.
♀	(M.C.Z. 52844)	Tunduru.	14.i.50.

Midbody scale-rows 19; ventrals 162-204 (♂♂ 162-170; ♀♀ 191-204); subcaudals 17-27 (♂♂ 24-27; ♀♀ 17-21). An unfortunate misprint—showing ♀ subcaudals as 17-32, instead of 17-22, occurs in the synopsis of scale-counts accompanying my (1944q, pp. 159-169) revision of this genus. Largest ♀ (M.C.Z. 52844), 632 (600 + 32) mm. The stomach of one Liwale snake held a worm-lizard (*Amphisbaena iondesii*). See also remarks under *u. unicolor*.

Amblyodipsas katangensis ionidesi LOVERIDGE

♂	(M.C.Z. 52849)	Kilwa.	16.vii.51.
10 ♂♂, 13 ♀♀	(M.C.Z. 52850-67)	Liwale.	2.vi.50-19.xi.52.
1 ♂, 3 ♀♀	(M.C.Z. 52845-8)	Tunduru.	30.xii.51-21.iii.53.

Midbody scale-rows 15; ventrals 165-205 (♂♂ 165-184; ♀♀ 178-205); subcaudals 15-25 (♂♂ 22-25; ♀♀ 15-20); postocular one (39 sides) or absent (17). Underside of nine snakes are more or less checkered, of 17 wholly black. Otherwise in substantial agreement with the original description (Loveridge, 1951a, p. 193) except that the maximum measurements are now surpassed by a ♂ (M.C.Z. 52850), of 320 (291 + 29) mm., and a ♀ (M.C.Z. 52851), of 370 (346 + 24) mm. The stomachs of two *A. k. ionidesi* held worm-lizards (*Amphisbaena ionidesii*).

Chilorhinophis carpenteri liwaleensis LOVERIDGE

4 ♂♂, 9 ♀♀ (M.C.Z. 52829-34) Liwale. 23.iii.50-20.i.52.

Midbody scale-rows 15; ventrals 218-256 (♂♂ 218-230; ♀♀ 241-256); subcaudals 19-29 (♂♂ 27-29; ♀♀ 19-23); tail included in total length 10.5-19.1 times (♂♂ 10.5-12.9; ♀♀ 16.6-19.1); in this instance sexing is based not on dissection but on the characters set forth in the generic key and original description (cf. Loveridge, 1951a, pp. 194, 196). Largest ♀ (M.C.Z. 52832), exceeds previous records by measuring 360 (339 + 21) mm. Two of the series had recently swallowed limbless lizards of a species (*Amphisbaena ionidesii*) also discovered by Mr. Ionides. Known to the Ngindo as *kitandamba*, a name applied also to *Hemirhagerrhis*, etc., which see.

Aparallactus sp.

In 1948 Mr. Ionides sent me a pair of centipede-eaters from Liwale that were superficially so similar it was difficult to believe they represented two distinct species. However, though with a query, I (1951a, pp. 199-200) correctly assigned them to *A. werneri* and *A. c. capensis*. Subsequently I wrote to Mr. Ionides soliciting his co-operation in securing a good series of each in order that I might elucidate relationships and more conclusively establish the scope of variation within each species. Mr. Ionides responded magnificently, and the following notes—based on a critical examination of over 200 snakes that involved several weeks of study—reveal the distinctness of the two species in question.

In my revision (1944q, pp. 181-213) of these little black-headed snakes, I treated *lunulatus* (then ranging from the Transvaal north to the Belgian Congo and Tanganyika Territory) and *concolor* (then ranging from Tanganyika Territory north to Eritrea and the Anglo-Egyptian Sudan) as full species. However, Witte and Laurent (1947, p. 110) synonymized *concolor* with *lunulatus* though stating (p. 113) that such synonymizing was only provisional and that possibly *concolor* should be recognized as a race of *lunulatus*. Unfortunately they figured a typical *concolor* as *lunulatus*. In the east the subspecific suggestion appears to reflect the situation, but in the southern Sudan the position remains confused for we have typical *lunulatus* at Torit (6 ex.), Terangore (3 ex.) and Nimule (2 ex.), but *concolor* also at Nimule (4 ex.) and Magwe (1 ex.) which is about 36 miles south-west of Torit.

Until more material from Uganda and northern Kenya is available the area of intergradation cannot be plotted satisfactorily.

The Ionides material has effectually cleared up a potential problem, however, for he wrote me saying that the snakes I was calling *uluguruensis* (which was based on a series of all-black adults) appeared to be the same as what the British Museum determined as *guentheri* (based on a white-collared juvenile). The fine series, representing all ages, obtained by Ionides, enabled me (1953e, p. 150) to synonymize *uluguruensis* with *guentheri*, which I had to recuscitate from the synonymy of *capensis*. Nor can *guentheri*, though so closely related to *capensis* except in colour (*vide infra*), be regarded as a race of the Cape Centipede-eater for both occur together at Liwale in miombo savannah. Previously I had supposed that *guentheri* (as *uluguruensis*) was the montane-forest representative of the savannah-dwelling *capensis*, a view which Ionides points out (4.vii.50) is untenable. He was pleased to learn that his suspicions were confirmed, and the white-collared blackish juveniles eventually turn into uniformly black adults.

It is surprising to find four members of the one genus occurring at Liwale, especially seeing that the diet of all appears to be restricted to centipedes. At least one centipede being recovered from one of each of the four species. As *Aparallactus* species invariably have 15 midbody scale-rows this character has not been checked except in a relatively few individuals.

It is hoped that the accompanying synopsis and table of variation will prove useful in aiding others to identify their material with greater ease.

Synopsis of *Aparallactus* occurring at Liwale

1. Postoculars 2 (rarely 1); parietal separated from upper labials by temporals; first lower labial in contact with its fellow behind the mental; head black; nape with a light-edged six-scale-wide, black collar; back and tail pinkish buff to reddish brown; below white; size up to 390 mm. (a ♀ cotype from the Usambara mountains) . . . *werneri*.

   Postocular 1; parietal in contact with[1] fifth, rarely fourth, upper labial . . . 2.

2. First lower labial in contact with its fellow behind the mental; color varying from those with head black, nape with a light-edged black collar; back and tail reticulated pale brown above; below white; to those that are uniform black above and plumbeous below; size up to 525 mm (a ♀ topotype from Tete, Mozambique *l. lunulatus*).

   First lower labial separated from its fellow behind the mental . . . 3.

3. Young are black above with two light-edged collars separated by five to seven scales; back and tail uniform plumbeous or steely blue; below throat white, and body basically so but heavily infuscated with grey. Adults uniformly black above, black or grey below; size up to 400 mm. (an Amani paratype of the syn. *uluguruensis*) . . . *guentheri*.

   Both young and adults coloured much the same as *werneri*; size at Liwale up to 315 mm. (410 mm., in Cape Province of the Union of South Africa) . . . *c. capensis*.

DATA DERIVED SOLELY FROM THE IONIDES MATERIAL

Species of *Aparallactus*	Post-oculars	Parietal and 5th labial	First lower labials in	Ventrals in ♂♂	Ventrals in ♀♀	Caudals in ♂♂	Caudals in ♀♀
werneri	2	separated	contact	139-150	147-162	38-45	33-41
l. lunulatus	1	contact	contact	146-155	153-175	52-60	49-55
guentheri	1	contact	separated	137-150	152-163	44-52	42-48
c. capensis	1	contact	separated	129-140[2]	132-158	38-46	36-46

[1] Separated in only one of the 129 snakes examined.
[2] 152 in a solitary, but unquestionable, ♂ (M.C.Z. 52007) which in this one respect seems to have a feminine characteristic.

Aparallactus werneri BOULENGER

27 ♂♂, 49 ♀♀ (M.C.Z. 51701-19, 52868-74) Liwale. 21.xii.49-26.i.52.

Ventrals 139-162 (♂♂ 139-150; ♀♀ 147-162); subcaudals 33-45 (♂♂ 38-45; ♀♀ 33-41); preocular 1; postoculars 2, rarely 1 (on 12 sides only); temporals 1 + 1; upper labials 5, the second and third entering the orbit; lower labials 5, the first pair in contact behind the mental, the first 3 in contact with the anterior sublinguals. Largest ♂ (M.C.Z. 52868), 271 (230 + 41) mm.; largest ♀ (M.C.Z. 52871), 269 (230 + 39) mm.; smallest ♂ and ♀ (M.C.Z. 52870, etc.), 113 (96 + 17) mm.

In the report on Ionides' earlier collection I (1951a, p. 199) queried the identification of the solitary *werneri* (M.C.Z. 50093) partly because of its colour (buff like *capensis*, whereas the extensive series of topotypical *werneri* that I collected in the Usambara Mountains was distinctly olive), partly on size (the cotype was 120 mm., longer than the largest Liwale specimen), and its postoculars (the normal two on the right but only one on the left). This condition occurs in 4 of the 76 snakes, but 4 others have a single postocular on both sides. The slight difference in size does not furnish reasonable grounds for recognizing a savannah race; the olive hue of the forest-edge reptiles is fugitive, after almost 30 years in alcohol, and the Amani snakes are now as buff as the Liwale reptiles.

Aparallactus lunulatus lunulatus (PETERS)

2 ♂♂ (M.C.Z. 51750) Kilwa. 19.vii-2.xi.50.
5 ♂♂, 11 ♀♀ (M.C.Z. 51745-9, 52875-9) Liwale. 13.iii.50-15.iii.52.
♂ (M.C.Z. 52904) Masasi. 19.vi.51.
♂ (M.C.Z. 52880) Nachingwea. 3.xi.51.
♂ (M.C.Z. 52881) Ruponda. 26.xii.51.
4 ♂♂, 2 ♀♀ (M.C.Z. 52882-6, 52903) Tunduru. 29.xii.51-12.i.52.

M.C.Z. 52903 is the only one of the series which agrees with the northern *A. l. concolor* in having the nasal well separated from the preocular, though in two or three others these scales meet in a point. See also remarks under *Aparallactus* (*vide supra*).

Ventrals 146-175 (♂♂ 146-155; ♀♀ 153-175); subcaudals 49-60 (♂♂ 52-60; ♀♀ 49-55); preocular 1; postocular 1; temporals 1 + 1; upper labials 6, the third and fourth entering the orbit; lower labials 6, rarely 7, the first 4 (3 on right side of I. 3685) in contact with the anterior sublinguals. Largest perfect ♂ (M.C.Z. 52875), 407 (320 + 87) mm.; largest perfect ♀ (M.C.Z. 52906), 459 (370 + 89) mm., but both sexes exceeded in head and body length by specimens of 390 and 340 mm. respectively, with truncated tails. Truncated tails are present in only 6 (4 of which are ♀♀) of the 27 specimens listed above.

In colour these snakes range from a typically reticulated, pale brown ♀ (M.C.Z. 51749) of 370 mm., with traces of about 30 dusky crossbars on the dorsum and uniform white below; or a young 220-mm. ♂ (M.C.Z. 51750) that is plumbeous above with a black, posteriorly light-edged, nuchal collar; below uniform white becoming greyish posteriorly, to specimens that are uniformly black above and white-throated below with each ventral white-edged (♀ M.C.Z. 51748) or wholly plumbeous (♀ M.C.Z. 51749).

Aparallactus guentheri (BOULENGER)

Aparallactus guentheri, Boulenger (part), 1895, Ann. Mag. Nat. Hist. (6), 16, p. 172: Zanzibar (possibly coast opposite. Omit Angola. Based on a faded juvenile displaying a nuchal collar).

Aparallactus uluguruensis, Barbour & Loveridge, 1928, Mem. Mus. Comp. Zool., 50, p. 132; Nyange, Uluguru Mountains, Tanganyika Territory (based on ten collarless and almost uniformly black adults).

18 ♂♂, 22 ♀♀ (M.C.Z. 51730-44, 52887-900) Liwale. 4.i.50-5.i.52.
2 ♀♀ (M.C.Z. 52901-2) Tunduru. 18.i. & 4.ii.52.

Ventrals 137-163 (♂♂ 137-150; ♀♀ 152-163); subcaudals 42-52 (♂♂ 44-52; ♀♀ 42-48); preocular 1; postocular 1; temporals 0 + 1 + 1; upper labials usually 6, the third and fourth entering the orbit, rarely 5, with the second and third entering (on right side only of M.C.Z. 51739 and 52891); lower labials either 5, with the first 3 (73 sides) in contact with the anterior sublinguals, or 6, with the first 4 (8 sides) in contact. Largest perfect ♂ (M.C.Z. 51736), 375 (300 + 75) mm.; largest ♀ (M.C.Z. 52893), 392 (320 + 72) mm.

Colour. Above, black, except in young which have *two* white collars, the anterior about one scale in width (but expanding on the sides) immediately behind the parietals, separated by 6 or 7 (4 or 5 on Mbololo and Mlalo snakes) black scales from the posterior collar which is about 2 scales wide (but expanding on the sides). Below, black, uniform except in young which exhibit a variable amount of white from mental to a point below the posterior nuchal collar with which it merges. The Liwale series displays every stage in the disappearance of the white collar and gular markings as throat and neck become suffused with darker.

Ionides (4.vii.50) points out that this species which, as *uluguruensis*, I had assumed was the montane-forest representative of *c. capensis*, occurs alongside *capensis* in miombo savannah. He noted with pleasure that his suspicions regarding the white-collared juvenile becoming the uniformly black adults, had proved correct.

Aparallactus capensis capensis A. Smith

3 ♀♀	(M.C.Z. 51751-2)	Kilwa.	16.x.50-9.xii.51.
25 ♂♂, 25 ♀♀	(M.C.Z. 50094, 51720-9, 52907-54)	Liwale.	21.ii.50-7.xi.53.
♀	(M.C.Z. 52936)	Nachingwea.	4.xi.51.
2 ♀♀	(M.C.Z. 52901-2)	Tunduru.	31.xii.51 & 25.i.52.

Ventrals 129-158 (♂♂ 129-140 and one, M.C.Z. 52007, with 152; ♀♀ 135-158); subcaudals 36-46 (♂♂ 38-46; ♀♀ 36-46); nasal in contact with preocular except in two specimens (M.C.Z. 50094; 52911); preocular 1; postocular 1; temporals 0 + 1 + 1 except in M.C.Z. 52009 where the parietal is separated from the fourth upper labial (as in *werneri*, which species it is not, as the first lower labial is well separated from its fellow behind the mental); upper labials 6, the third and fourth entering the orbit, except on one side of two snakes where it is the second and third of 5 or 6 labials respectively; lower labials 5 or 6, the first 3, rarely 4 (three sides) or 5 (one side), in contact with the anterior sublinguals. Largest ♂ (M.C.Z. 52910), 271 (215 + 56) mm.; largest ♀ (M.C.Z. 51729), 315 (257 + 58) mm. Smallest ♂ (M.C.Z. 52908), 121 (97 + 24) mm., and ♀ (M.C.Z. 52925), 113 (95 + 18) mm., both being taken on 2nd April, 1951.

ELAPIDAE

Elapsoidea sundevallii decosteri Boulenger

juv. ♂	(M.C.Z. 48951)	Ruangwa River.	1941-2.
3 ♂♂, 1 ♀	(M.C.Z. 52937-9)	Liwale.	viii.45-20.i.52.
2 ♂♂, 3 ♀♀	(M.C.Z. 52940-3)	Tunduru.	30.i-26.ii.52.

Midbody scale-rows 13; ventrals 145-157 (♂♂ 149-157; ♀♀ 145-147); subcaudals 16-23 (♂♂ 20-23; ♀♀ 16-17); nasal in contact with (in 7 snakes) or separated from (in 3) the preocular. While one 168 mm. ♂ (M.C.Z. 48951) displays 11 white crossbands on the dorsum, plus 2 on the tail, their width being about half that of the chocolate-brown interspaces, another ♂ (M.C.Z. 52938) of 252 mm., shows almost as little white as the eight adults. Largest ♂ (M.C.Z. 52937), 576 (540 + 36) mm., largest ♀ (M.C.Z. 52942), 490 (462 + 28) mm., but neither are records for this race. On 30th January the smallest ♀ held 4 eggs measuring from 21-23 × 8 mm.; on 26th February the largest ♀ held eight eggs from 20-21 × 7 mm. The stomach of one Tunduru snake held the forepart of a frog, apparently *Hemisus m. marmoratum*.

I have included the Ruangwa River specimen, presented to the museum by Mr. R. de la B. Barker, as it is the first record of this race occurring in Tanganyika Terr tory.

Naja nigricollis nigricollis REINHARDT

juv. ♂ (M.C.Z. 52944) Tunduru. 5.i.52.

Midbody scale-rows 19; ventrals 174; subcaudals 62.

Ionides writes (20.i.50) that a four-and-three-quarter-foot ♀ captured in a fowlhouse promptly disgorged five hen's eggs. For seven weeks he fed her on rats, which she took readily, and periodically milked her of venom. At the end of that time she died. [Possibly from loss of venom which is a potent factor in a snake's digestion. A.L.] On 30.vi.52 Ionides saw the corpse of a cobra that had swallowed an adult Great Girdled-Lizard (*Gerrhosaurus m. grandis*).

Writing on 16.xi.52 Ionides tells of an incident which had occurred that morning at Luhuu Juu in Liwale District. On the previous day a fish trap (*ngonyo*), having been removed about a hundred yards from the water, was left on open sand where it filled with grasshoppers (*panzi*) that could not possibly escape. In the morning the surrounding sand revealed the tracks of a ♀ *nigricollis* which had circled about the trap before entering it. The distended stomach of the reptile, which was about four and a half feet long, showed she had recently fed well and there was not a single grasshopper left in the trap. If the cobra did not swallow them, the sole alternative would seem to be that some other creature had entered the trap, eaten the orthoptera, and then itself been swallowed by the snake. However, there were no tracks on the sand to substantiate this theory, besides which the bulge in the cobra was long and gradual—instead of abrupt as would have been the case if the swelling was caused by the presence of a toad, bird, or rodent.

Dendroaspis polylepis polylepis (GUNTHER)

juv. ♀ (M.C.Z. 52945) Liwale. 1-15.iii.52.
juv. ♂ (M.C.Z. 52946) Tunduru. 20.i.53.

Living examples of this mamba from Kilwa and Masasi have been sent to the London Zoological Gardens by Mr. Ionides.

Midbody scale-rows 21-23; ventrals 257-259; subcaudals 108-116; colour olive; mouth membranes black. ♂ measures 620 (500 + 120) mm.; the ♀ is only 3 mm. longer.

Ionides states (5.i.53) that in October, 1952, he suddenly came upon a large *polylepis* at close quarters. The mamba raised its head with about a foot of its body clear of the ground as it spread a hood so large that Ionides took a good look to be sure it was not a cobra. Meanwhile Ionides retreated to gain possession of his snake-stick which was being carried by a man behind; before he got it, however, the snake made off. Again on 5th January, 1953, Ionides surprised a female which started away but, on finding herself followed, turned about as she spread a quite pronounced hood, though smaller than that of a cobra. The mamba reared up about two feet from the ground. After remaining motionless for a while she slowly advanced towards a small patch of grass that lay between them. For a short time she continued to stare at Ionides over the grass, then made for a termite hill. Ionides gave chase, caught her, and later sent her to the Regent's Park Zoo.

VIPERIDAE

Atractaspis bibronii rostrata GUNTHER

♂ (M.C.Z. 52950) Kilwa. 23.viii.50.
34 ♂♂, 37 ♀♀ (M.C.Z. 52951-53000) Liwale. 10.i.50-10.iv.52.
♂ (M.C.Z. 53001) Mbwera near Madaba. 24.ix.52.
2 ♀♀ (M.C.Z. 53002) Ruponda. 5.iii.50-26.xii.51.
11 ♂♂, 10 ♀♀ (M.C.Z. 53003-19) Tunduru. 26.i.50-9.iii.52.

In the report on Ionides' earlier collection I (1951a, p. 202) used the name *bibronii* for Tanganyika snakes as the then available information regarding South African *bibronii* did not justify separation. After the paper was in galley a belated reply arrived from Dr. V. FitzSimons of the Transvaal Museum, furnishing the midbody scale counts for their material of *bibronii* from south of the Zambezi. Of 17 snakes from Southern Rhodesia; Bechuanaland; Transvaal and Natal, all but three had 21 midbody scale-rows. Consequently I follow Laurent (1945, p. 335) who revived *rostrata* for the snakes north of the Zambezi where it will be noted that specimens with 23 scale-rows predominate.

Midbody scale-rows 21 (3 specimens), 22 (1) or 23 (92); ventrals 220-251 (♂♂ 228-248; ♀♀ 220-251); subcaudals 18-28 (♂♂ 21-28; ♀♀ 18-23; unquestionably overlapping as both sexing and extreme counts have been double checked); preocular 1, except in M.C.Z. 52980 where it is fused with the supraocular on the right side, and M.C.Z. 53000, 53016 on both sides; postocular 1; temporals 1 + 2, except on right side of M.C.Z. 52989 where it is 1 + 3, and M.C.Z. 53009, 53013, where the anterior temporal is fused with the fifth labial, making it the largest, otherwise upper labials 5, rarely 6, the third and fourth entering the orbit, the fourth largest; lower labials 5, rarely 6, the first pair in contact (except in M.C.Z. 52999, where they are separated) behind the mental, the first 3 in contact with the anterior sublinguals, third lower labial much the largest. Largest ♂ (M.C.Z. 52951), 600 (562 + 38) mm.; largest ♀ (M.C.Z. 52976), 677 (645 + 32) mm.

While the overwhelming majority are uniformly black above and plumbeous below, three Liwale ♂♂ and four ♀♀ have pure white anals, and several others are more or less white about the lower jaws and throat. The Mbwera ♂ is blackish grey above and entirely china white on the upper labials, lower flanks and undersurface, the two being separated by a scale-wide, dusky, lateral line. One 547 mm. ♀ (M.C.Z. 52980), is an ivory white *albino*.

The albino *Atractaspis* was concealed in a piece of dry and rotting wood that was being split for fuel. The parti-coloured Mbwera male was also taken from a hollow log.

The stomach of one adder held the remains of a lizard, apparently *Latastia johnstoni*. Ionides reports removing a young *Psammophis angolensis* from another.

Writing on 27.iii.50, Ionides states that a few days previously one of his porters was jabbed in a finger by a small *Atractaspis*. Ionides opened the puncture with a razor blade and rubbed in permanganate. Except for a rather swollen hand the man, who was possibly more frightened than hurt, seemed all right at time of writing. On 17.xii.51 Ionides wrote: "Yesterday a porter was struck by one fang of a large *Atractaspis*. I injected him with 10 c.c. of FitzSimon's serum and, except for a swollen hand, he seems to be alright." Ionides reports that on 30th December 1951 he was struck on the finger by an *Atractaspis* (I. 2390). For 24 hours no treatment was adopted but pain at the site of the punctures was severe enough to prevent Ionides getting much sleep the first night. Next day hot fomentations were applied to the site of the bite, but without opening the punctures. The hand had swollen to above the wrist and there was pain and swelling in the armpit. Next day these symptoms began subsiding and by the fourth day had receded to the first joint of the affected digit. By the eighth day—7th January, on which he wrote me—the discoloration surrounding the punctures had almost disappeared.

Causus rhombeatus (Lichtenstein)

2 ♂♂, 2 ♀♀ (M.C.Z. 53105-6) Songea. 28.viii.48-ii.52.

Midbody scale-rows 17-18; ventrals 140-148; subcaudals 23-29. Almost uniform brown or grey above, a variation that crops up in other parts of the range of this widespread Rhombic Night-Adder. Larger ♂ (M.C.Z. 53105), 554 (495 + 59); larger ♀ (M.C.Z. 53106), 613 (555 + 58) mm.

Causus defilippii (Jan)

♀	(M.C.Z. 53020)	Kilimarondo.	10.xii.51.
2 ♂♂, 3 ♀♀	(M.C.Z. 53021-2)	Kilwa.	3.viii.50-9.xii.51.
62 ♂♂, 74 ♀♀	(M.C.Z. 53023-100)	Liwale.	24.iii.50-28.xii.52.
2 ♂♂, 4 ♀♀	(M.C.Z. 53101-2)	Ruponda.	25-26.xii.51.
2 ♂♂	(M.C.Z. 53103-4)	Tunduru.	7.iii.52.

As this series contains more than three times the total number of *defilippii* recorded in the literature since Jan first described the species in 1862, it presents so many variations that I have dealt with them in more than usual detail. Hitherto, for example, the number of midbody scale-rows was thought to be only 17!

Midbody scale-rows 13-17 (13 in M.C.Z. 53021 only; 15 in 10 Liwale snakes; 16 in 40; 17 in 99); ventrals 109-130 (♂♂ 109-121; ♀♀ 117-130; however, as only 10 ♂♂ have as many as 117 or over, and only 4 ♀♀ have as low as 117 or under, it might be said that ♂♂ usually range from

109-116 and ♀♀ from 118-130); subcaudals 13-18 (♂♂ 13-17; ♀♀ 11-17); preoculars 1 to 2 (though 1, through fusion, on 8 sides only); suboculars 1 to 2, rarely 0 or 3 (18 sides with 0; 94 with 1; 80 with 2; and 8 with 3); postoculars 1 to 2 (though 1, through fusion, on 7 sides only); temporals 1 + 2 (3 sides), 1 + 3 (2), 2 + 2 (2), 2 + 3 (251), 2 + 4 (37), 3 + 3 (2), 3 + 4 (2), 3 + 5 (1); upper labials 5 to 7 (but 6 on all but 12 of the 300 sides) excluded from orbit, except on 5 sides; lower labials 8 to 10, usually 9, the first 3-5, usually 4, in contact with the anterior sublinguals.

Largest ♂ (M.C.Z. 53104), 348 (320 + 28) mm.; largest ♀ (M.C.Z. 53051), 406 (380 + 26) mm., the latter surpassed by one of 412 mm. in Chicago Natural History Museum. Smallest ♂ (I. 3706), 113 (105 + 8) mm.; smallest ♀ (M.C.Z. 53100), 139 (130 + 9) mm.

As to hatching, these vipers being oviparous, the eight youngest snakes, their total lengths being under 128 mm., were all taken in March.

On	1-15th	Mar.	at Liwale,	a ♀ held	5	eggs	measuring	from	about	15 × 11	to	18 × 10mm.
,,	14th	Dec.	,, ,,	,, ,, ,,	6	,,	,,	,,	,,	14 × 7	,,	16 × 7 ,
,,	19th	,,	,, ,,	,, ,, ,,	6	,,	,,	,,	,,	15 × 9	,,	17 × 9 ,,
,,	20th	,,	,, ,,	,, ,, ,,	6	,,	,,	,,	,,	15 × 7	,,	16 × 9 ,,
,,	23rd	,,	,, ,,	,, ,, ,,	3	,,	,,	,,	,,	16 × 8	,,	17 × 7 ,,
,,	25th	,,	,, ,,	,, ,, ,,	8	,,	,,	,,	,,	15 × 8	,,	16 × 8 ,,
,,	26th	,,	,, Ruponda	,, ,, ,,	8	,,	,,	,,	,,	15 × 8	,,	16 × 8 ,,
,,	26th	,,	,, ,,	,, ,, ,,	6	,,	,,	,,	,,	about		15 × 7 ,,
,,	26th	,,	,, ,,	,, ,, ,,	6	,,	,,	,,	,,	,,		24 × 9 ,,

The intestines were frequently choked with the hard parts of insects (heads of ants, beetles, etc.), but presumably these had been liberated by the digestive juices from the stomachs of amphibia swallowed by the adder. One large millipede, however, may well have been swallowed by the snake. Amphibians were usually too digested for identification, but I was able to recognise the following species: *Bufo r. regularis*; *Arthroleptis s. stenodactylus; Phrynobatrachus* (?) *acridoides* and *Spelaeophryne methneri.*

A tick (*Amblyomma* sp.), at present unidentifiable as to species, was attached to the throat of one Liwale viper. Defilippi's Night-Adder is known as *kihambi* to the Ngindo (*fide* Ionides).

Bitis arietans arietans (Merrem)

6 foetuses (M.C.Z. 52947-9) Tunduru. 2 & 10.i.52.

Five, dated 2nd January, are still in the foetal membranes, a ♂ (M.C.Z. 52948) measuring 205 180 + 25) mm.; the ♀ (M.C.Z. 52949), dated 10th January, measures 206 (190 + 16) mm. All are from a brood of 57 reported by Ionides as present in a single ♀. Ionides, writing on 8.v.50, says that a Puff Adder killed at Mandera, British Somaliland, "which must have measured over four feet," held the horns of an adult ♂ dikdik whose partially digested remains filled the stomach. *Lipili* or *lipiri* is the Mwera, *not* the Ngindo, name writes Mr. Ionides.

AMPHIBIA

CAECILIIDAE

Schistometopum gregorii (Boulenger)

♂ (M.C.Z. 27901) Ruvu Ferry. 25.v.51.

As Ruvu Ferry is only a few miles north of Bagamoyo, in the Eastern Province of Tanganyika Territory, this record constitutes a noteworthy southward extension of the range for a species heretofore known only from north of the Tana River in Kenya Colony.

Body annuli 117 (primaries only; 137 with secondaries); midbody diameter 8.5 mm., contained 35.3 times in the total length of 300 mm. Both stomach and intestines appeared to contain only mud.

BUFONIDAE

Bufo carens A. Smith

4 ♀♀	(M.C.Z. 27902-3)	Kilwa.	10-21.viii.50.
♂	(M.C.Z. 27904)	Liwale.	12.iii.49.
♀	(M.C.Z. 27905)	Songea.	15.v.50.

The customary pair of dark lumbar spots of the Red Toad are absent in this ♂, which measures 78 mm. from snout to anus.

Bufo regularis regularis Reuss

♀	(M.C.Z. 27906)	Kilwa.	12.viii.50.
♀	(I. 2339)	Liwale.	16.iv.50.

This is the widespread Square-marked Toad originally described from Cairo. A young one was recovered from the stomach of a night-adder (*Causus defilippii*).

Bufo anotis Boulenger

♀ (M.C.Z. 27907) Kilwa. 25.viii.50.

This Earless Toad, taken during dry weather at the edge of a small lake, is new to Tanganyika Territory; for the toads from western Tanganyika that, in 1925, I erroneously referred to as *anotis* I subsequently described as a new species (*ushoranus*). The Kilwa specimen, 35 mm. in length, has been compared with nine topotypes of *anotis* from Chirinda Forest, Southern Rhodesia. It differs only in that its rich gamboge yellow undersurface lacks the markings which are present in all Chirinda toads, though in two of them the markings are reduced to one or two brown flecks in the pectoral region.

RHACOPHORIDAE

Chiromantis xerampelina Peters

4	(M.C.Z. 27908)	Kilwa.	11-21.viii.50.
1	(I. 2432)	Liwale.	17.vii.50.
2	(M.C.Z. 27909)	Tunduru.	8.i.50.

The two largest ♀♀ (M.C.Z. 27908-9) are only 68 and 70 mm. long.

Afrixalus fornasinii fornasinii (Bianconi)

13 (M.C.Z. 27910-1) Kilwa. 12-25.viii.50.

Ten are typical, having an anteriorly acuminate, broad, brown, vertebral stripe; the backs of the other three are uniform, thus agreeing with *Megalixalus fornasinii* var. *unicolor* Boettger (1913) which Noble (1924) referred to the synonymy. This disposition I have consistently supported, for such variants occur in most large series. Consequently I disagree with Laurent's (1951c, p. 24) recent revival of *unicolor* subspecifically for a ♀ from Gazi, Kenya Colony, whose vertebral stripe was reduced to an oblong spot. Nor can I concur with Laurent's action in resuscitating *loveridgii* Procter (1920) as a subspecies of *fornasinii* to whose synonymy I referred it. Length of largest, a ♀, 36 mm.

Hyperolius concolor tuberilinguis A. Smith

♀ (M.C.Z. 27912) Tunduru. 8.i.50.

Length 29 mm. Recently I (1953f, p. 354) have discussed this race at considerable length, stating that I regard Zambezi examples of *citrinus* Günther, and *H. sansibaricus loveridgei* (Laurent), 1947, from Kitaya, Ruvuma River, Tanganyika Territory, as synonyms.

Hyperolius puncticulatus subsp.

♀ (M.C.Z. 27913) Tunduru. 8.i.50.

From posterior border of eye to the anus the light lateral band is edged above by a very narrow brown line, while below, from groin to eye, by a very broad brown band which is continued from front of eye to nostril as a relatively narrow stripe. Gravid. Length 28 mm.

Hyperolius parkeri rovumae LOVERIDGE

♀ (M.C.Z. 27914) Kilwa. 25.viii.50.

Length of adult, snout to anus, 23 mm.

RANIDAE

Rana galamensis bravana PETERS

3 juv. (M.C.Z. 27915) Kilwa. 25.viii.50.

Lengths are from 35 to 38 mm.

Rana oxyrhynchus oxyrhynchus A. SMITH

7 (M.C.Z. 27916) Kilwa. 11.viii.50.
♂ ♀ (M.C.Z. 27917) Tunduru. 9.vi.50.

Largest ♀♀ from above localities are 52 and 48 mm. respectively. Each frog has been individually tested and found to conform to the typical (lowland) race as defined in my (1953f, p. 369) key to the amphibia of Nyasaland.

Rana mascareniensis mascareniensis D. ET B.

3 juv. (M.C.Z. 27918) Kilwa. 11.viii.50.

Only 23-29 mm. As with the preceding and following species of *Rana* these frogs have been tested by the aforementioned key.

Rana mascareniensis uzungwensis LOVERIDGE

♀ (M.C.Z. 27919) Liwale. 18.vii.50.

Length 41 mm.

Rana ansorgei BOULENGER

♀ (M.C.Z. 27920) Kilwa. 21.viii.50.
♂, 3 ♀♀ (M.C.Z. 27921-2) Tunduru. 6-8.i.50.

The above records reveal the distribution of this species as trans-African (Benguela to Kilwa) in these latitudes. Tibio-tarsal articulation of the adpressed hind limb reaches eye (Kilwa), end of snout or just beyond (Tunduru); length of tibia more or less than half the length from snout to anus; first, second, third and fifth toes with two phlanges free of web, fourth toe with three phlanges free. Length of ♂ (M.C.Z. 27921), 45 mm., of gravid ♀ (M.C.Z. 27922), 48 mm.

Rana ornata ornata (PETERS)
♀ (M.C.Z. 27923) Kilwa. 1.iii.50.

The type of this handsome frog came from Taita, in Kenya, and I am anxious to obtain examples from there, even more so of the very similar *Rana macrotympanum* from west of the Juba River, Gallaland. No one has obtained any of the latter since it was described over 40 years ago and

I very much doubt whether frogs from the Northern Frontier District are really distinct. Unfortunately these frogs, characterized by two longitudinal white lines on an otherwise black throat, being burrowers, appear only for a brief period at the onset of the rains.

Rana adspersa edulis (PETERS)

♂ ♀ (M.C.Z. 27924) Tunduru. 8.i.50.

Lengths of 140 and 145 mm. respectively, but the sexing of the deviscerated ♀ was done by the collector. Mr. Ionides also informs me that these bullfrogs are called *bumi* (pl. *mabumi*) by the Ngindo in distinction to the Swahili *chura* which is applied to frogs in general by the Ngindo.

In their eagerness to feed, these voracious bullfrogs will gulp down almost anything. The stomach of one held a piece of bark measuring 29 × 23 mm., a stout leaf 35 × 12 mm., and numerous twigs of which the largest was 23 × 1.5 mm. In addition to the usual mass of indeterminate insect remains, my colleague Dr. P. J. Darlington recognized the 45 mm. antennae of a cerambycid, a longicorn, and a hard-shelled tenebrionid.

Phrynobatrachus acridoides (COPE)

1 (I. 1716) Tunduru. 8.i.50.

The state of preservation of this 25 mm. frog leaves its specific determination slightly conjectural. Stomach distended by ants, one of which was apparently a driver (*Dorylus* sp.). One *Phrynobatrachus* was recovered from the stomach of a night-adder (*Causus defilippii*).

Hemisus marmoratum marmoratum (PETERS)

3 (I. 2281-2, 2300) Liwale. 25-28.iv.50.

Lengths are from 21-33 mm.

BREVICIPITIDAE

Spelaeophryne methneri AHL

♂, ♀, juv. (M.C.Z. 27925-6) Litumba. 30-31.v.50.
♀ (I. 2299) Liwale. 28.iv.50.

A young one was present in the stomach of a night-adder (*Causus defilippii*).

Litumba is at 3,900 feet in the Matengo Highlands of Songea District, so that the capture of these Scarlet-snouted Frogs by Mr. Ionides extends the known range considerably to the southwest. One stomach held small beetles in addition to numerous ants' heads. The fat bodies were very distended as if in preparation for aestivation. Length of ♂, 48 mm., of ♀, 55 mm. Diameter of largest ova in the ♀ almost 2 mm.

Phrynomerus bifasciatus bifasciatus (A. SMITH)

♂ ♀ (M.C.Z. 27927-8) Kilwa. 12.viii.50.
♂ ♂ (I. 2266, 2241) Liwale. 15-16.iv.50.

BIBLIOGRAPHY[1]

BOGERT, C. M.

1940. "Herpetological Results of the Vernay Angola Expedition." Bull. Amer. Mus. Nat. Hist., **77**, pp. 1-107, figs. 1-18, pl. i.

LAURENT, RAYMOND

1945a. "Contribution a la Connaissance du Genre *Atractaspis* Smith." Revue Zool. Bot. Afr., **38**, pp. 312-343.

1951c. "Catalogue des Rainettes Africaines (genres *Afrixalus* et *Hyperolius*) de la Collection du Museum National d'Histoire Naturelle de Paris." Ann. Soc. Roy. Zool. Belgique, **82**, pp. 23-50, figs. 1-2.

LOVERIDGE, ARTHUR

1942d. "Revision of the African Lizards of the Family Gerrhosauridae." Bull. Mus. Comp. Zool., **89**, pp. 483-543.

1942e. "Scientific Results of a Fourth Expedition to Forested Areas in East and Central Africa. IV. Reptiles." Bull. Mus. Comp. Zool., **91**, pp. 237-273, pls. i-vi.

1944p. "Revision of the African Lizards of the Family Cordylidae." Bull Mus. Comp. Zool., **95**, pp. 1-118, pls. i-xii.

1944q. "Further Revisions of African Snake Genera." Bull. Mus. Comp. Zool., **95**, pp. 119-247.

1946e. "A New Worm-Lizard (*Ancylocranium barkeri*) from Tanganyika Territory." Proc. Biol. Soc. Washington, **59**, pp. 73-74, pl. xiii.

1947a. "Revisions of the African Lizards of the Family Gekkonidae." Bull. Mus. Comp. Zool., **98**, pp. 1-469, pls. i-vii.

1951a. "On Reptiles and Amphibians from Tanganyika Territory collected by C. J. P. Ionides." Bull. Mus. Comp. Zool., **106**, pp. 177-204, text fig.

1951c. "Synopsis of the African Green Snakes (*Philothamnus* inc. *Chlorophis*), with the Description of a new Form." Bull. Inst. Roy. Sci. Nat. Belgique, **27**, pp. 1-12.

1953e. "Zoological Results of a Fifth Expedition to East Africa. III. Reptiles from Nyasaland and Tete." Bull. Mus. Comp. Zool., **110**, pp. 141-322, pls. i-v.

1953f. "Zoological Results of a Fifth Expedition to East Africa. IV. Amphibians from Nyasaland and Tete." Bull. Mus. Comp. Zool., **110**, pp. 323-407, pls. i-iv.

MERTENS, ROBERT

1942e. "Die Familie der Warane (Varanidae). III. Taxonomie." Abhand. Senckenberg. Naturf. Ges., No. 466, pp. 237-391.

WITTE, G. F. AND LAURENT, RAYMOND

1942c. "Liste des Lacertidae du Congo belge et Description d'une Espece nouvelle." Revue. Zool. Bot. Afr., **36**, pp. 165-180.

1947. "Revision d'un Groupe de Colubridae Africains (Genres *Calamelaps*, *Miodon*, *Aprallactus* et Formes affines)." Mem. Mus. Roy. Hist. Nat. Belgique (2), fasc. 29, pp. 1-124, figs. 1-132.

1 Where a date is followed by a letter of the alphabet, it indicates a particular paper listed in a comprehensive (1880-1955) bibliography of African herpetology which it is hoped to publish in due course. Where no letter follows the date it implies that the author in question published only a single article on African herpetology during the year in question.

AN APPRECIATION

MAJOR KENNETH DE PLANTA BEATON

Ken Beaton, known to a wide circle of friends as a man of many attributes, started life in Blantyre, Nyasaland, in 1905, where his father was General Manager of the African Lakes Corporation. At the age of two he went to Scotland, and again moved with his family to Kenya in 1910. They lived on a small farm near Nairobi, where it was Ken's particular task, even at this young age, to tend cattle, horses, donkeys, dogs, cats, poultry, and a variety of young wild animals, which he also regarded as his friends. Educated first at the Government School, Nairobi, and later at Melville College, Edinburgh, he returned to Kenya at the age of 19 to be apprenticed to Major Dunbar of Sotik, on a coffee farm. Here was a life which Ken really enjoyed, for it gave him sufficient leisure to pursue his great interest in wild life, to learn the ways of the big beasts of the Chepalunga forest, and to go on many a safari. Ken's father then purchased a farm in Sotik, and imported a couple of hounds and a hunter, which enabled him to become a great enthusiast of the Sotik Hunt, and later M.F.H.

The war period saw him at once in the K.A.R., where he took part in the Abyssinian campaign and the battle of Gondar, later to be stationed in Madagascar, and finally as O.C. Troops, Zanzibar. On demobilization he found that his farm had been ruined by lack of adequate supervision, and in 1946 he joined the Kenya National Parks as warden of the Nairobi National Park. His great love and knowledge of wild animals shone through his delightful weekly articles in the "East African Standard" and enabled so many readers to know some of the denizens of the Nairobi National Park almost personally and by name. Having so successfully completed the initial development of the Nairobi National Park, particularly through its difficult stages, he was then seconded to the Uganda Government to undertake the development of the Uganda National Parks, where he later became Director and Chief Warden. With his great knowledge and resourcefulness, in a remarkably short time he brought the Queen Elizabeth National Park forward to a point where in 1954, he had the honour of entertaining Her Majesty the Queen and His Royal Highness the Duke of Edinburgh, as guests of the Park.

It was indeed a tragedy that even before 1954 was out, Ken Beaton was no longer spared to fulfil further plans he had in mind for the development of the Murchison Falls Park. His many friends and all lovers of animals will always feel a certain sadness at the loss of Ken Beaton, but they will remember him as a man with a charming smile, a friendly disposition, and good company under any conditions. His work, both in Kenya and Uganda, will stand as a memorial to one who devoted so much zeal to the protection of wild animals.

M.H.C.

BOOK REVIEWS

"The Freshwater Mollusks of Uganda and Adjacent Territories," by G. Mandahl Barth, d.sc. Annales du Musée Royal du Congo Belge, Octavo Series, Science Zoologiques Vol. 32, pp. 207 and 95 text figs. 7 × 11 inches, Tervuren 1954. (Paper covers.)

It would be very difficult to overestimate the importance of this volume. It is the first general study of a group of snails for a whole territory to appear since Von Marten's "Beschalte Weichthiere" nearly 60 years ago. The main importance of the paper does not, however, rest there. A very large number of papers have appeared on the Mollusca of East Africa—several hundred in fact, most of which merely describe a large number of new species based mainly on the shells alone. In a group like the Mollusca where most of the classification depends on the soft anatomy, the chaos resulting from this is unbelievable, particularly in a group where the shells are similar. For instance several dozen *Helicarions* have been described only a few of which had their anatomy examined at the time of description. Until each species has been re-collected in the type locality and dissected, it will not even be possible to say how many *genera* are represented in the group, let alone arrange the species. In the Freshwater Mollusca there are several genera where, from a study of the shells alone, every different author has suggested a different means of classification. Moreover, these very genera contain species with extremely polymorphic shells. Unfortunately this holds true particularly for those genera (*Bulinus* and *Biomphalaria*) which are important vectors of the *Schistosoma* spp. which cause *Bilharzia*. Many recent papers have appeared concerning the shells. One author sinks the lot into two species, another recognizes a dozen or so; still another recognizes a dozen but this time a *different* dozen and also disagrees with the other's names. It is little wonder that the medical profession are a little dazed about all this. Mandahl Barth has based his main conclusions on anatomy and his arrangement of the species is therefore, I think, much more trustworthy than any other previous attempts. Dr. Mandahl Barth was brought up in the rigorous Danish anatomical "school" so well exemplified by the works of the late Dr. C. M. Steenberg. This book is recommended to all the serious students of malacology and tropical disease workers as a profoundly accurate book. It is certainly not the last word on the subject by any means and parts are out of date already. For instance *Biomphalaria adowensis* and *B. ruppellii* are probably conspecific and not separate species as treated in his book. So much depends on seeing the original types which in a polymorphic species are difficult to interpret.

Mandahl Barth deals with 126 species and subspecies which are adequately illustrated by line drawings. He has found it necessary to erect three new genera in the *Planorbidae* and quite a number of new species and subspecies. Some of his names may be commented on—*Physopsis* is treated as a subgenus of *Bulinus*—all the "Unios" are treated as *Caelatura*. One unfamiliar change which, however, seems plausible is the segregation of the African *Viviparus* into a genus *Bellamya* (actually erected long ago by Jousseaume). The anatomical evidence given is rather striking but it will be a change which will take many years to become accepted. I have also found the species and subspecies of this genus accepted by Mandahl Barth rather difficult to separate and think that further study over a wider range will reduce them.

The book is written in English, a concession which many continental writers make, knowing full well our painful ignorance of their languages. It is well printed on good paper as is usual with the publications of Belgian Museums, but there are rather numerous misprints. I think a deep debt of gratitude is due to the Belgian Museums in post-war days for coming to the rescue of scientists looking for publishers. Many publications (including some of my own) have been produced in record time at great expense to themselves.

B.V.

(**Note:** It is proposed shortly to place on view in the museum a small exhibit of *Bilharzia*-carrying snails.)

"The Veronicellidae of Africa (Mollusca Pulmonata)," by Dr. Lothar Forcart. Annales du Musée Royal du Congo Belge, Octavo Series, Science Zoologiques Vol. 23, pp. 110 and 5 plates. 7 × 11 inches, Tervuren 1953. (Paper covers.)

The *Veronicellidae* (or *Vaginulidae* as they were once better known) are extremely interesting

and rather attractive slugs. This revision of all the African species is a valuable study which must have entailed a considerable amount of work. I am not qualified to discuss Forcart's conclusions since I know nothing about the anatomy of the group, but I feel he may have erred on the side of "lumping". Seven taxa are recorded from our area and may easily be identified by anyone who has this book and is mildly skilled with dissecting instruments.

The retouched photographs illustrating the anatomy are novel, but I am not convinced that they convey as much as a line drawing, although they undoubtedly give a more accurate picture of actual shape. The photographs of the beasts themselves are excellent and reproduced as only collotype can reproduce with every original detail faithfully depicted. Unfortunately external features are rather useless in this group as in most slugs.

Dr. Forcart's kindness in using the English Language has led to inaccuracies which would not otherwise have occurred—the English is quaint and in places quite difficult to understand and misprints are rather common. This does not, however, detract from the value of this addition to the books on African Mollusca.

B.V.

"Exploration Hydrobiologique du Lac Tanganyika (1946-47)." Résultats Scientifiques Vol. III Fascicle 1. Lamellibranches, by EUGENE LELOUP, pp. 154 and 8 plates and innumerable text figures, 10 × 13 inches. Institut Royal des Sciences Naturelles de Belgique. Brussels 1950 Vol. III Fascicle 4 Gastéropodes by EUGENE LELOUP, pp. 274 and 13 plates, 1953.

This large quarto work can only be described as sumptuous on a scale associated with the previous century only. The text figures are in hundreds and the plates illustrate a very large number of shells. These two works (which I have had bound together) are essential for any student of African Mollusca and will enable any shell from the Lake to be named.

The number of works dealing with or touching on the mollusca of this lake is now over a hundred! This great interest is due to the fact that a certain section of the snails ("thalassic") in the lake have a truly incredible resemblance to marine shells. This led to the now discarded theory of an inland Jurassic sea. It is now believed that the resemblance is due to parallel evolution in a very ancient body of water.

Various conchologists, notably J. R. Bourguignat, multiplied the number of genera and species occurring in the lake to an alarming extent. He even split one species into two genera and over a dozen species. This has complicated matters. I rather feel that Leloup has erred in precisely the opposite direction. In *Edgaria nassa* forma *grandis* he has for example compressed dozens of species formerly distributed among *three* genera. Apart from figuring many radulae I believe this sinking has not been done with any anatomical basis though I admit that it is the result of examination of a vast amount of shells. His treatment of the non-thalassic *Planorbidae* etc. is similar and directly contradicts the conclusions of Ranson and Mandahl Barth, to mention only two anatomists.

Everyone interested in shells should have this work since one can give a name to anything one may find in Lake Tanganyika. It is written in an easy French style easily understood even by poor linguists.

B.V.

"Études sur les Mollusques de l'Afrique Centrale et des Régions Voisines. I Vertiginidae et Valloniidae," by DR. W. ADAM, pp. 725-817 with 25 text figures; extracted from Volume Jubilaire Victor Van Straelen Tome II. 4vo. Institut Royal des Sciences Naturelles de Belgique 1954.

This very painstaking revision deals with a group of mostly minute shells, some only 1-2 mm. in length. It is mainly concerned with the Belgian Congo but deals with many species occurring in East Africa. The figures which are the work of Mme J. van Melderen-Sergysels are exquisitely executed.

B.V.

(The reviewer regrets that he does not know the price of any of the works mentioned since all were complimentary copies. They are obtainable from the museums and institutes concerned.)

"Birds of Arabia," by COLONEL R. MEINERTZHAGEN. (Oliver and Boyd, 1954. One vol., pp. 624, plus 19 coloured plates, 9 photographs and many text figures and maps. £4. 4. 0.)

Books describing the birds of a given region can usually be grouped into three classes, each intended for a certain type of reader: (*a*) those designed for the ornithologist-collector; (*b*) those designed for the field-watcher, and (*c*) those designed for both.

As an example of class (*a*), take Jackson's "Birds of Kenya and Uganda"—features: large size, with a limited number of coloured plates containing few birds per plate, and with detailed keys for the identification of specimens in the hand. For class (*b*), take Peterson's "Birds of Europe"—features: small size, with many coloured plates containing many birds per plate, and with detailed notes for the identification of birds in the field. For class (*c*), take Praed and Grant's "African Handbook"—features: medium size, with many coloured plates containing several birds per plate, and with abbreviated specimen-keys and notes for field-identification. On the whole I feel that the "hybrid" class (*c*) is at a disadvantage in trying to combine two subjects, each of which requires individual treatment; therefore, I think that classes (*a*) or (*b*) are preferable.

The volume now under review is a very fine example of class (*a*). One of its most striking features is the quality of the coloured plates, mostly done by Mr. D. M. Reid-Henry. They are wonderful!

Mr. Henry has few, if any, equals in the way he makes his birds look alive. Take, for instance, his drawing of an Olive Thrush (Pl. VI): the bird is simply overflowing with vitality!

The Arabian backgrounds to several of the plates are strikingly beautiful also: look, for instance, at the blazing desert sunset in the Lammergeier picture (Pl. XI), or the cool mountain valley in the Green Pigeon picture (Pl. XIV).

The book would be well worth buying on account of the plates alone, but the letterpress is excellent also. Colonel Meinertzhagen is one of our most original (as well as distinguished) ornithologists, and a speciality of his, which cannot be too much praised, is to delve into what one might call the byways of ornithology, concerning which he launches into fascinating little digressions here and there. For instance, I will mention some topics discussed in the book, from a summary at p. 72: bird collisions; fainting and feigning death; love of sweet food; pattering and puddling; variation in colour of eggs; animals drinking salt water; and recognition by birds of the Sabbath and the gun. You could hardly have a more catholic list than this!

In the course of the introduction a number of major topics are discussed in detail, of which the most interesting, to me, was on desert coloration. The author, whose experience of the subject must be unsurpassed, feels that the pale-buff "desert colour" possesses, as its primary advantage, the maximum capacity to neutralize the heat of the sun, and therefore, to keep the birds cool. He does not deny that desert coloration also possesses a protective value against predators, but thinks that this is a minor advantage as compared with protection against climate.

The detailed list of birds seems to be very good too. Included in this there are some useful reviews (with maps, not confined to Arabia), of certain species, such as *Pycnonotus capensis*, the African Bulbul, and *Streptopelia turtur*, the Turtle Dove. With reference to the latter, it is interesting to note that the author considers our East African species *S. lugens* to be a race of *turtur*—partly, I gather, on the grounds that the calls of the two birds are "precisely similar". Both calls are well known to me and I would agree that there is a striking similarity in pitch and time, but they are not identical—*lugens* has a deep, growly song which is nearly an octave deeper than the shrill, purring song of *turtur*. In view of this fact, the question whether *lugens* may still be regarded as a race of *turtur* requires reconsideration.

Both the letterpress of this book, and also the plates, are reproduced to perfection, for which the publishers, Messrs. Oliver and Boyd, deserve every credit.

M.E.W.N.

"I Drank the Zambezi," by ARTHUR LOVERIDGE. (Lutterworth Press, London: 1954: pp. 287, many photographic illustrations. 15/-.)

Those who have read Mr. Loveridge's two previous books, "Many Happy Days I've Squandered" and "Tomorrow is a Holiday" will be pleased to welcome this third popular work to their bookshelves. Forsaking Tanganyika on this occasion the author describes, in his lucid and easy-to-read style, his safari in Nyasaland during 1948 and 1949. The purpose of the "ulendo" was to collect natural history specimens for Harvard's Museum of Comparative Zoology. His adventures are related in a form which retains the reader's attention throughout the book, whether the reader be interested in Natural History or merely in travel.

The reviewer was most interested—and somewhat amused—to note that Mr. Loveridge makes no mystery of either Mlanje Mountain or of the Nyika Plateau, as does the author of another book whose path Mr. Loveridge crossed when on his journey!

Mr. Loveridge knew and loved Africa and the African in the period prior to 1939: his reaction to and comments on the post-war changes are both reasonable and pointed. This is a book everyone interested in Africa must own.

N.M.

LETTERS to the EDITOR

The Editor,
The Journal of the East African Natural History Society.

SIR,

I was most gratified to read Sir Charles Belcher's generous and detailed review of "A Check List of the Birds of Nyasaland", by myself, in Journ. E.A. Nat. Hist. Soc., vol. xxii, no. 3 (95), 1954, pp. 124-127. His contribution to it, both indirectly by his own book on the birds of Nyasaland, and directly by the mass of breeding data which he provided me with, cannot be over-emphasized.

There are a few points arising therefrom which seem worthy of further mention :—

(*a*) *Page* 125, *final paragraph:* The reference to Belcher's "Birds of Nyasaland" and to Roberts' "Birds of South Africa" are not to pages but to the serial number allocated to the relevant species. This is explained in section 2 of the Introduction.

(*b*) *Page* 126, *fourth paragraph:* I realized that omission of authors' names for both species and races might arouse comment. Thus see also Macdonald, "African Affairs", vol. 53, no. 211, 1954, p. 172, and Vincent, "Ostrich", 1954, p. 102. The explanation for this is of course given in section 2 of the Introduction, *i.e.* economy of space.

The "umlaut" was inserted in the original typescript wherever applicable. But the printer found its retention impracticable. Nevertheless, I feel that the printer has carried out his share of the task extremely well.

(*c*) *Page* 126, *fifth paragraph.* The reference 90 to local breeding of the Osprey is to Nyasa Journ. vol. 4, no. 2, 1951, p. 50, and reads as follows :— "African fishermen call the Fish-Eagle 'nkwazi', and the Osprey 'chakame', and I have been told by those on Likoma Island that the latter nests there during the dry season, in baobab trees. Mr. R. C. Wood has in fact seen an Osprey's nest, in which there were young, at Chiromo, on the River Shire. Unfortunately he has lost the detailed notes, including the date, which he made at the time, now more than thirty years ago." Sir Charles would doubtless agree that Mr. Wood is an entirely reliable observer.

It is worth mentioning that I have recently (13th December 1953) collected at Bulaya, Mporokoso district, Northern Rhodesia, a *Clamator jacobinus* containing a fully developed egg. This is turquoise blue, not white, in colour; size approximately 21 × 19 mm. (see also Belcher, "Nature in East Africa", ser. 2, no. 2, 1949, p. 17). The parent is white below, with chin, throat and chest tinged slightly grayish. A clutch of three similarly coloured turquoise eggs of *Turdoides leucopygia* was collected in the same locality on 27th October, 1953.

Centropus senegalensis and *C. monachus* (notwithstanding Verheyen's observations in "Exploration du Parc National de l'Upemba. Oiseaux," 1953, p. 323, I still prefer to follow Chapin, "The Birds of the Belgian Congo," vol. 2, 1939, p. 211, see reference 134 in my Check List, in regarding *C. cupreicaudus* as a distinct species) have a wide area of overlap in the Ethiopian region, according to the distributions as given, for example, by Chapin *op. cit.*

The reference to *C. s. burchellii* under no. 212 is certainly not clear. The sentence in question would read better as follows :— "Habitat as last, and indistinguishable from *C. s. burchellii* in field." *C. senegalensis flecki* is of course easily distinguishable from *C. superciliosus loandae* even at a considerable distance by the absence of a superciliary streak and by the black rather than brown colouring on the head. In these respects *C. superciliosus burchellii* resembles *flecki* rather than *loandae*, even though it is conspecific with, and, as indicated, intergrades with *loandae.*

The calls of *Caprimulgus p. poliocephalus* and *C. p. guttifer* are practically, if not entirely, identical. Reference 128 in the Check List, *i.e.*, "Ostrich," 1952, p. 151, is the key to this. I have heard this mellow and beautiful call in northern Nyasaland, at Nyeri and Ngong in Kenya, and in southern Abyssinia ("Ibis", 1945, p. 508). On taxonomic considerations, too, I have no doubt that *C. p. poliocephalus* and *C. p. guttifer* are conspecific.

The name "Narina" was first given to the commoner of the two Trogons by its discoverer, Levaillant, and is derived from a Hottentot beauty for whom he professed great admiration: see Stark & Sclater, "The Birds of South Africa," vol. iii, 1903, p. 122.

In regard to *Anthus leucophrys* and *A. vaalensis*, so far as I am aware, no striking difference of behaviour, voice, etc. has been definitely found between the two. This would have been perhaps better put down as another of the doubtful cases, as that of the Yellow Wagtails which Sir Charles mentions.

I had not had the opportunity to investigate the question of the correct specific name for *Pycnonotus*. In this and other such cases I followed Mackworth Praed and Grant's nomenclature. I only deviated from this on the basis of personal experience, or where some other author had given reasons for using a different name which seemed over-ridingly convincing to me. Greater emphasis might have been laid on this in section 2 of the Introduction.

C. W. BENSON.

C/o Game and Tsetse Department,
P.O. Box 72,
LUSAKA,
Northern Rhodesia. 20th July, 1954.

MEAT-EATING DUIKERS

Sir,

In the Journal, p. 73, antea, Mr. Merrell Dalton asks if any readers have known of a duiker eating meat. The following may therefore interest him.

During the Campaign in East Africa in 1916 I was at General Smuts' Headquarters and one of my subalterns had for a time a tame duiker that used to relish scraps of meat.

The Africans of many tribes have told me during the last 40 odd years that duikers stalk and eat fowls. Whilst serving in Uganda over 30 years ago the R.C. Bishop confirmed this. He said he was losing fowls, so one night left his car facing the fowl-run, and on hearing a commotion, switched on the headlights and found a duiker was the cause of the trouble.

On one occasion when out shooting in Kenya I observed a duiker stalking guinea fowl. But the latter were too wary and the duiker did not secure one.

I have many times told the Africans to prove to me that duikers attack fowls, and they have since done so. About dusk some years ago they called me to witness a stalk. The duiker approached stealthily on the feeding fowls and we waited and watched. Eventually it was close enough to seize one with a rush and I shot the duiker in the act with the fowl in its mouth, though not much hurt.

H. F. STONEHAM

Director (Stoneham Museum, Kitale)

Printed by
East African Standard Ltd.
Nairobi

THE LIBRARY SMITHSONIAN INSTITUTION

SMITHSONIAN INSTITUTION THE LIBRARY

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01313 7070